Modeling and Simulation Body of Knowledge Index: An Invitation for the Final Phases of its Preparation

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1. INTRODUCTION

There is an urgency to finalize an M&S Body of Knowledge (M&S BoK) Index that is needed for so many essential professional developments. The essence of this article is to invite concerned simulationists – members or not of SCS – to benefit from their collective wisdom.

Work on the preparation of an M&S BoK Index has been ongoing for some time; and the authors have been collaborating for this end. For practical reasons, two web sites are devoted for the study. One, maintained by Tuncer Ören (M&S BoK Index – Ören) and another one at the SimSummit collaborative environment supporting an M&S BoK (M&S BoK Index – SimSummit). After finalization of the study, the official site will be the SimSummit's site.

One way to finalize the current study requires updating the index which is available at (M&S BoK Index – Ören) by taking into account the views of professional simulationists. They can be sent to the Letters to the Editor section of the SCS M&S Magazine or to Tuncer Ören directly. Opinions expressed in open literature are also monitored and are taken into account. Afterwards, the finalized draft needs to be voted on by a reasonably large number of representatives of the M&S professional.

2. CURRENT WORK

In part three of (M&S BoK Index – Ören), references are made to BoK’s of many other disciplines as well as to most of the studies of M&S BoK’s. The last section is still being updated. Some BoK’s of other disciplines indicate that having more than one BoK may be needed. At some appropriate time, this issue may be revisited for the M&S BoK Index.

Some of the publications/presentations we have on M&S BoK are the following: Lacy et al. (2010), M&S BoK Workshop’10 (2010), Ören (2005b, 2006), Ören and Waite (2007), and Waite and Ören (2009). There were also several meetings organized by Waite.

The most recent joint activity was the organization of a workshop on M&S BoK at the Summer Computer Simulation Conference 2010 (M&S BoK Workshop’10). Andreas Tolk who was an invited member of the panel of the workshop has an article titled: "M&S Body of Knowledge (BoK): Progress Report and Look Ahead" in this
issue of the SCS M&S Magazine. His emphasis on
models corresponds to our model-based
simulation. Some other members of the
workshop’s panel are planning to share their
opinions in the next (i.e., January) issue of the SCS
M&S Magazine.

3. NEED FOR A COMPREHENSIVE AND
INTEGRATIVE VIEW IN AN M&S BoK

Simulation—similar to mathematics—provides
infrastructure to hundreds of application areas
(Ören 2009a); and is also worth studying per se.
There are many definitions of simulation. A good
definition would cover all aspects of modeling and
simulation and would also allow a top down
decomposition of the field to allow elaboration on
all relevant aspects. Experiments and experience
are the essence of modeling & simulation. To
delineate the scope of the M&S BoK, we offer the
following definitions: (1) Simulation is performing
goal-directed experiments using a model of a
dynamic system. (2) Simulation is gaining
experience, by use of a representation of a system,
to enhance any one of three types of skills: motor
skills (by virtual simulation, or simulators),
decision making and communication skills (by
constructive simulation, gaming simulation, or by
serious games), and operational skills (by live
simulation).

A comprehensive and integrative view of M&S
provides a rich basis to explore several
possibilities that simulation offers. The last
presentation of the first author on the topic is
(Ören 2010c). Some of the publications /
presentations of the first author on a
comprehensive and integrative view and the
benefits of such a paradigm are: (Ören 2005a,
2009b, and 2010a).

In a comprehensive and integrative view, two
approaches are possible: (1) One can explore the
reality/model dichotomy from the point of view of
its use in art, engineering, science, decision
making, education, training, entertainment, as well
as representation and pretence. (2) Second
category of considerations consists of perceptions
of M&S from different perspectives to be able to
explore fully the possibilities it offers. These
perspectives are: (i) purpose of the use of
simulation, (ii) problem to be solved, (iii)
connectivity of operations of the real system and
the simulation, (iv) types of knowledge processing,
and (v) philosophy of science. The details can be
found at (Ören 2009b, 2010a, and 2010c).

Within this paradigm, one can perceive
modeling and simulation with all its richness. For
example model-based simulation fits very
naturally within this paradigm. Model-based
simulation has been advocated for a long time and
now is an important paradigm for modeling and all
types of model processing (Elzas et al, 1986, 1989;
1979; Ören et al. 1984; Zeigler et al. 1979, and
Zeigler and Ören 1979).

Some other milestones in the maturity of the
M&S discipline (Ören 2002, 2005a) are synergies
of simulation and artificial intelligence (including
software agents) and synergies of simulation and
systems engineering and software agents.

Some references on the synergies of simulation
and artificial intelligence are: Ören (1994 and
1995). Some references of the synergies of
simulation and software agents are: Ören et al.
annual international events are organized under the
umbrella of Agent-directed simulation (ADS) where the synergies of simulation and agents are explored under two categories: contributions of simulation to agents (i.e., agent simulation) and contributions of agents to simulation (which consists of agent-supported simulation and agent-based simulation) (ADSS'11).

Synergies of simulation, systems engineering, and agents open new vistas in advanced applications such as (1) simulation of systems of systems, simulation of emergence, and cognitive and emotive simulations (Ören 2010b; Yilmaz and Ören 2007, 2009a) and (2) realization of advanced M&S environments to tackle ever more challenging applications (Yilmaz and Ören 2009b).

A parallel study done on the terminology of M&S (M&S dictionary project) has a collection of about 9000 English terms and two versions of the dictionary are being prepared: English-Chinese and English-French-Italian-Spanish-Turkish versions. A preliminary hard copy edition (Ören et al. 2006) had about 4000 terms in English, French, and Turkish.

4. A SUGGESTED ROADMAP

We hope that our colleagues would care to express their views to complete and improve the M&S BoK index as posted at (M&S BoK Index – Ören, and M&S BoK Index – SimSummit). Browsing a presentation/publication on the big picture of M&S (e.g., Ören 2010c) may help to consider many of its aspects.

REFERENCES

(We note that the following references contain many pointers to the works of a large number of other specialists. To keep the size of the list of references to a minimum, we didn't include other references in this list. However, we aim to be as complete as possible in the Part 3 of the (M&S BoK Index – Ören). Another two place where very rich lists of M&S resources are maintained are (1) the Resources and (2) the Publications sections of the SCS M&S Newsletter – albeit fully accessible only to the members of SCS. (M&S Resources – SCS Newsletter; M&S Publications– SCS Newsletter).

ADSS’11. Agent-Directed Simulation Symposium (CFP) Spring Simulation Multiconference’11, April 4-9, 2011, Boston, MA, USA.


M&S BoK Index – Ören. 
http://www.site.uottawa.ca/~oren/MSBOK/MSBOK-index.htm

M&S BoK Index – SimSummit. SimSummit collaborative environment supporting an M&S BoK: http://www.sim-summit.org/BoK07/BoK_SharePoint.htm

M&S BoK Workshop’10. Workshop of M&S BoK at the Summer Computer Simulation Conference 2010, July 11-14, Ottawa, ON, Canada. 

M&S dictionary project. 
http://www.site.uottawa.ca/~oren/SCS_MSNet/simDic.htm

http://www.scs.org/newsletters/2010-10/index_file/Publications.htm


http://dx.doi.org/10.1142/S1793962310000079


**AUTHOR BIOGRAPHIES**

Author biographies can be found in previous issues of the M&S Magazine; namely, Ören (July), Waite (April).