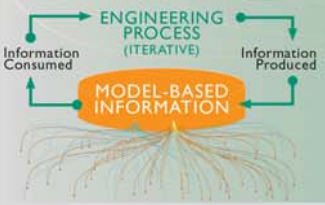
A MODEL-BASED ENGINEERING (MBE) MANIFESTO

PURPOSE: *To motivate the transformation to Model-Based Engineering.*



Faced with increasing system complexity, interdependencies, breakdown of document-based methods, and other challenges, MBE provides the transformation in which we value:

1. ***Information** over **artifacts***
2. ***Integration** over **independence***
3. ***Expressiveness with rigor** over **flexibility***
4. ***Model usage** over **model creation***

We value the items on the right, but not at the sacrifice of the items on the left.

WITH THESE PRINCIPLES:

*On behalf of stakeholders, MBE increases emphasis on **describing** the nature and content of the **information** produced and consumed, compared to the traditional emphasis on engineering process and procedure.*

*We recognize that—**independent** of specific Information format, structure, language, syntax, the sequence or order of its production and consumption, and the domains and environments of our projects—the underlying nature (**semantics**) of the **essential** information we seek to discover and produce is **invariant** because of the very nature of engineering.*

*An essential and dynamically changing property of model information is its **credibility** to those people and processes which will **consume** that information. The critical nature of some **intended uses** of model information sets a higher bar on required investment in model **verification**, **validation** and **uncertainty quantification**.*

*Principles of **human-machine interaction** applied to the targeted stakeholders are vital to success. Application of advanced visualization methods **and augmented intelligence** capabilities can advance that success.*

*We seek an extended team across engineering disciplines with **common and integrated understanding** of the identity and nature of the model information as well as its content.*

*We seek effective **enterprise-wide reuse** of model-based information to more fully leverage past individual or local learning.*

Systems engineering performed according to the above principles is required for the Engineering System itself, a complex and evolving system.

THE TEAM:

The team was assembled by invitation, intentionally drawing together different perspectives.

Sandia National Laboratories

Ed Carroll
Team lead-Sandia National Laboratories – Engineering Methods Research

Nancy Hayden
SNL– Autonomous Systems/ Engineering Policy

Sharon Trauth
SNL-Systems Engineering/ MBSE Practice

Dana Grisham
SNL-Data Governance/Agile Methods

LOCKHEED MARTIN

Chris Schreiber
Lockheed Martin Space Systems-Systems Engineering Modernization

ICTT System Sciences

Bill Schindel
ICTT Systems Sciences-Systems Sciences

ENGILITY

Frank Salvatore
Engility Corp-Systems Engineering/ Data Taxonomy

UNIVERSITY AT ALBANY

Eliot Rich
Univ at Albany, SUNY-System Dynamics

Teleconference participation from:

Jet Propulsion Laboratory
California Institute of Technology

Steve Jenkins
JPL-Systems Semantics

AOC ANNE O'NEIL CONSULTANTS LLC

Anne O'Neil
Anne O'Neil Consultants-Organizational Transformation

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THE INTERNATIONAL FEDERATION FOR SYSTEM RESEARCH (IFSR) CONVERSATION

St. Magdalena Hotel, Linz, Austria (located approx. 200 km west of Vienna).

TOPICS AND TEAM LEADERS AT THE 2018 IFSR CONVERSATION:

The International Federation for System Research sponsored the Nineteenth IFSR Conversation, this year in Linz, Austria. Conversation topics and team leaders included:

1. **Systems approach to Active and Healthy Aging** – *Gerhard Chroust and Shankar Sankaran*
2. **What is Systems Science?** - *Gary Smith and Jennifer Makar*
3. **Systems Practice** – *Nam Nguyen and Constantin Malik*
4. **Data Driven Systems Engineering Approaches** – *Ed Carroll*

CONVERSATION APPROACH:

Conversations were introduced by Bela H. Banathy around 1980 as an alternative to the classical conferences. In a IFSR Conversation a small group of scientists meets for several days to discuss in a self-guided way, a topic of scientific and social importance.

No papers are presented. The participants discuss their topic face-to-face. The Conversation typically accommodates approximately 30 people, divided into a maximum of 5 teams.

While participation is open to individuals in member organizations and others interested in the topics of the Conversation, the final selection of participants is only by invitation of the IFSR according to the prospective participant's ability to contribute to the outcomes.

Participants are expected to attend the whole Conversation. Each team meets for 5 days to develop conceptual models and intensify their understanding of the team's topic and to interact with other teams.

At the conclusion, each team presents its findings to the entire group. After the Conversation, the teams document their findings through a team report and possibly further papers, including the proceedings of the Conversation.

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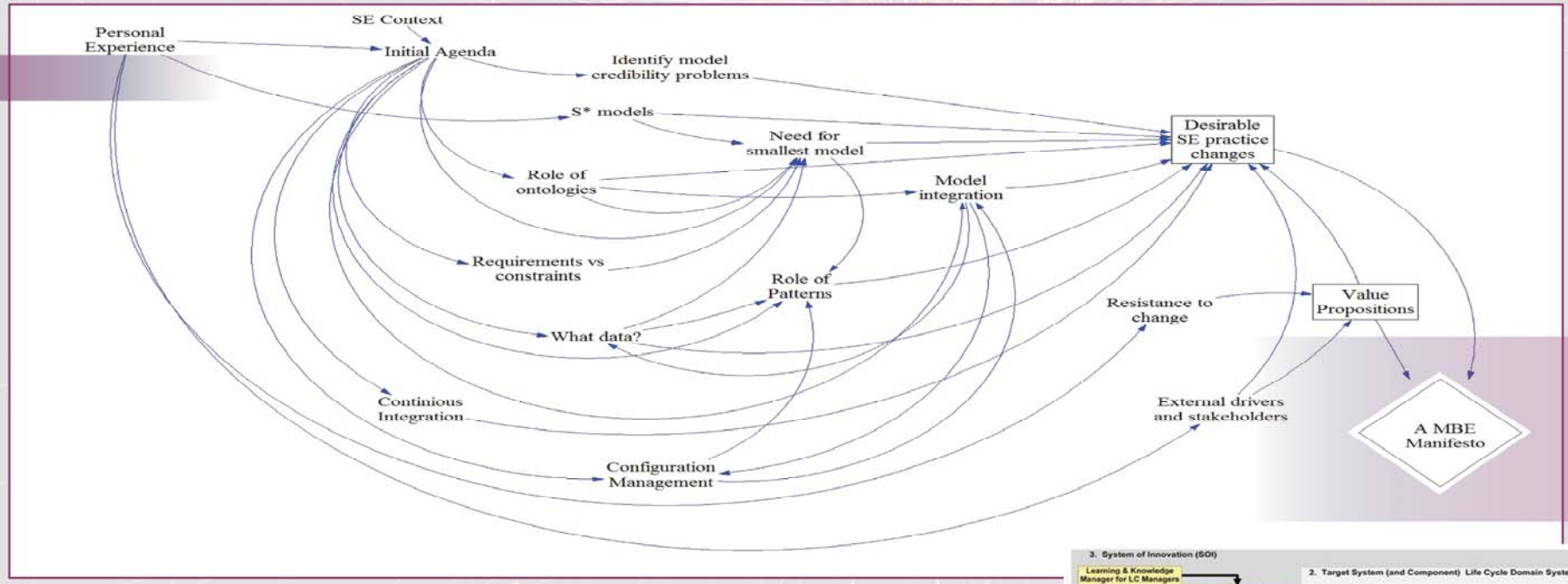
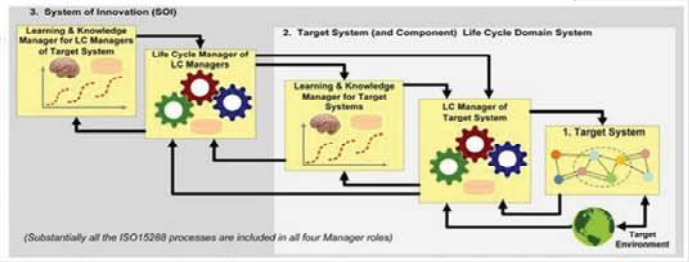
IN THE MONTHS PRIOR TO THE CONVERSATION, THE TEAM COLLABORATED EXTENSIVELY ON THE AGENDA

Our concern was to ensure that we had a week-long agenda that would produce worthwhile, engaging, and conclusive conversations. The resultant starting agenda was far too ambitious for time available. However, we had agreed before coming together that the agenda would be ours to manipulate and adjust as the week progressed.



*The final agenda that emerged encouraged conversation flowing through the S*System of Innovation paradigm, starting with the system model of the target system (S1), working upward toward the model of life cycle domain system – the system that manages the target system model (S2), and then on to the model of system of innovation – the system that evolves the life cycle domain system (S3).*



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