



INCOSE: TRANSFORMATION

Troy A. Peterson

INCOSE Assistant Director
Systems Engineering Transformation
troy.peterson@incose.org
Vice President & Technical Fellow
System Strategy, Inc. (SSI)



How Trustworthy are Your Models

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16000
MEMBERS



70
CHAPTERS



35
COUNTRIES



100
CORPORATE ADVISORY
BOARD MEMBERS

VISION:

- A better world through a systems approach.

MISSION

- To address complex societal and technical challenges by enabling, promoting, and advancing Systems Engineering and systems approaches.

INCOSE Strategic Objective (1/7):

- Accelerate the transformation of systems engineering to a model-based discipline.

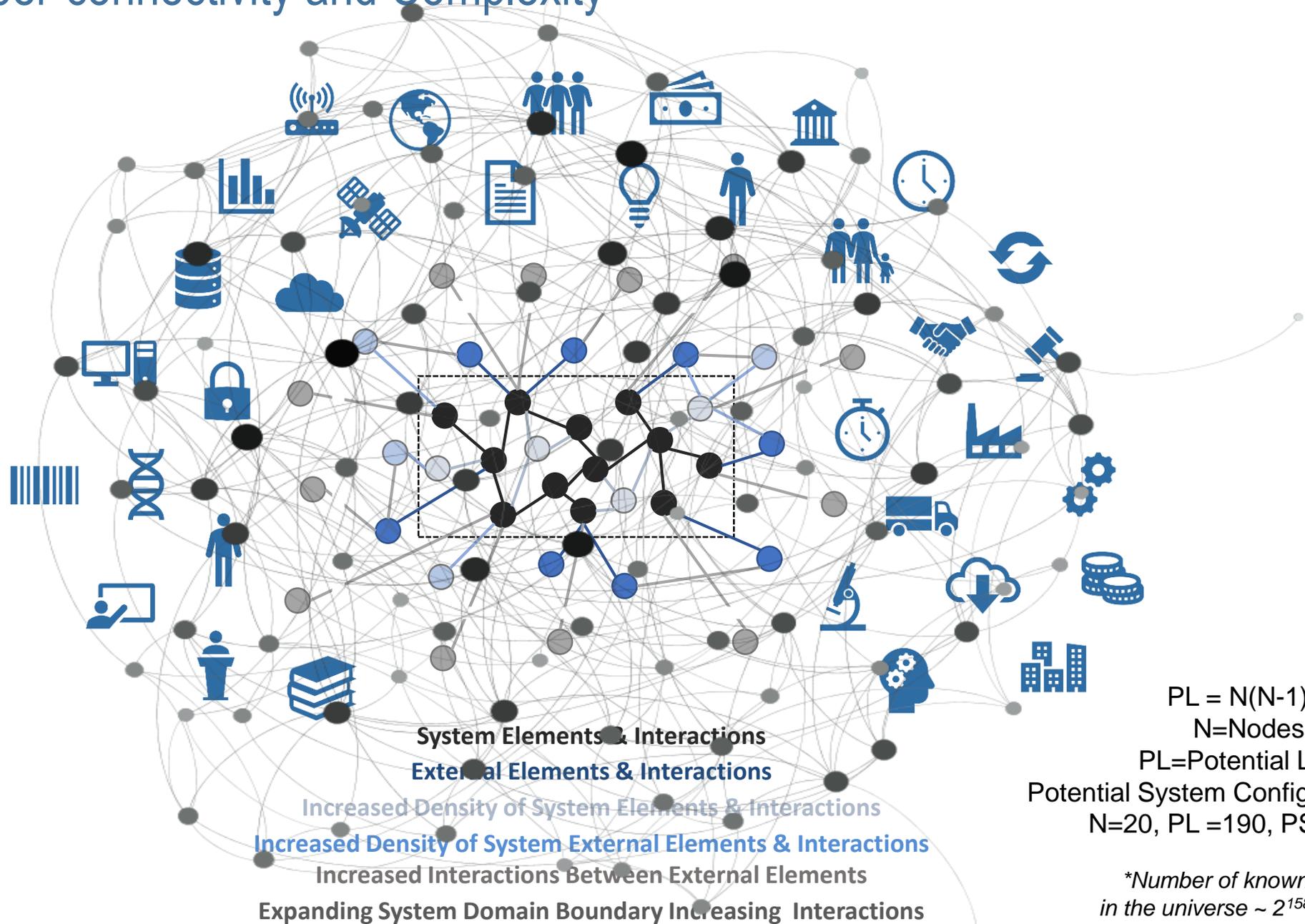
INCOSE Collaborations and Standards Development:

- INCOSE has several collaboration agreements with other institutions such as ISO, OMG, ASME, MORS, NAFEMS, PMI, ISSS, ISFR, IIE, and others
- Impacting over 20 standard related to systems engineering and/or modeling of systems

**Accelerating
Innovation
Effectiveness:**

Model-Facilitated
Collaboration by
Regulators, Technical
Societies, Customers,
and Suppliers

Hyper-connectivity and Complexity



$$PL = N(N-1)/2$$

N=Nodes
 PL=Potential Links
 Potential System Configurations = 2^{PL}
 N=20, PL=190, PSC = 2^{190} *

*Number of known atoms
 in the universe ~ 2^{158} and 2^{246}

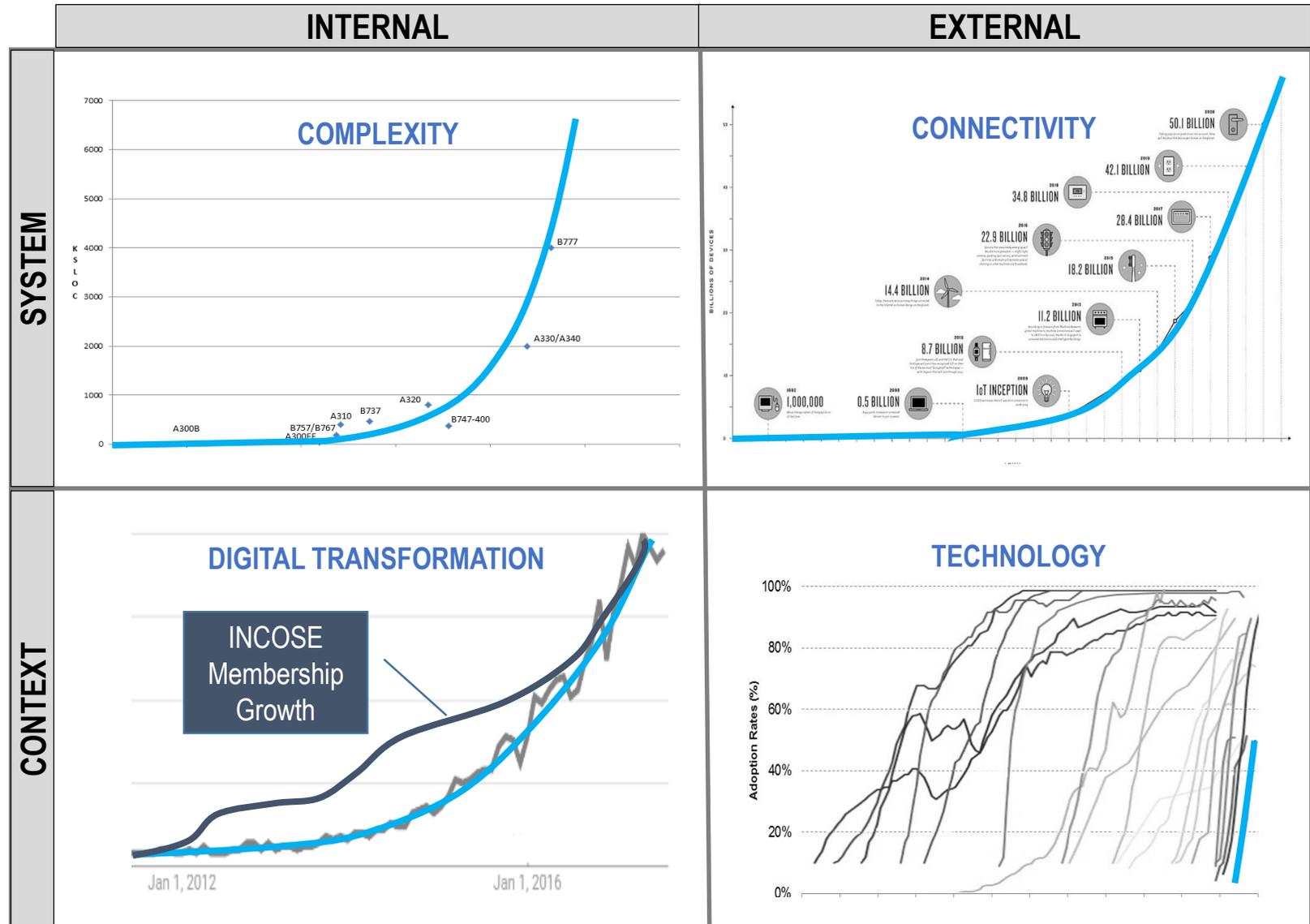
Why We Must Accelerate the use of Models

“Today more and more design problems are reaching insoluble levels of complexity.”

“At the same time that problems increase in quantity, complexity and difficulty, they also change faster than before.”

“Trial-and-error design is an admirable method. But it is just real world trial and error which we are trying to replace by a symbolic method. Because trial and error is too expensive and too slow.”

NSF is calling for methods to conceptualize and design for the deep interdependencies inherent in Cyber-Physical Systems.



THE WALL STREET JOURNAL.

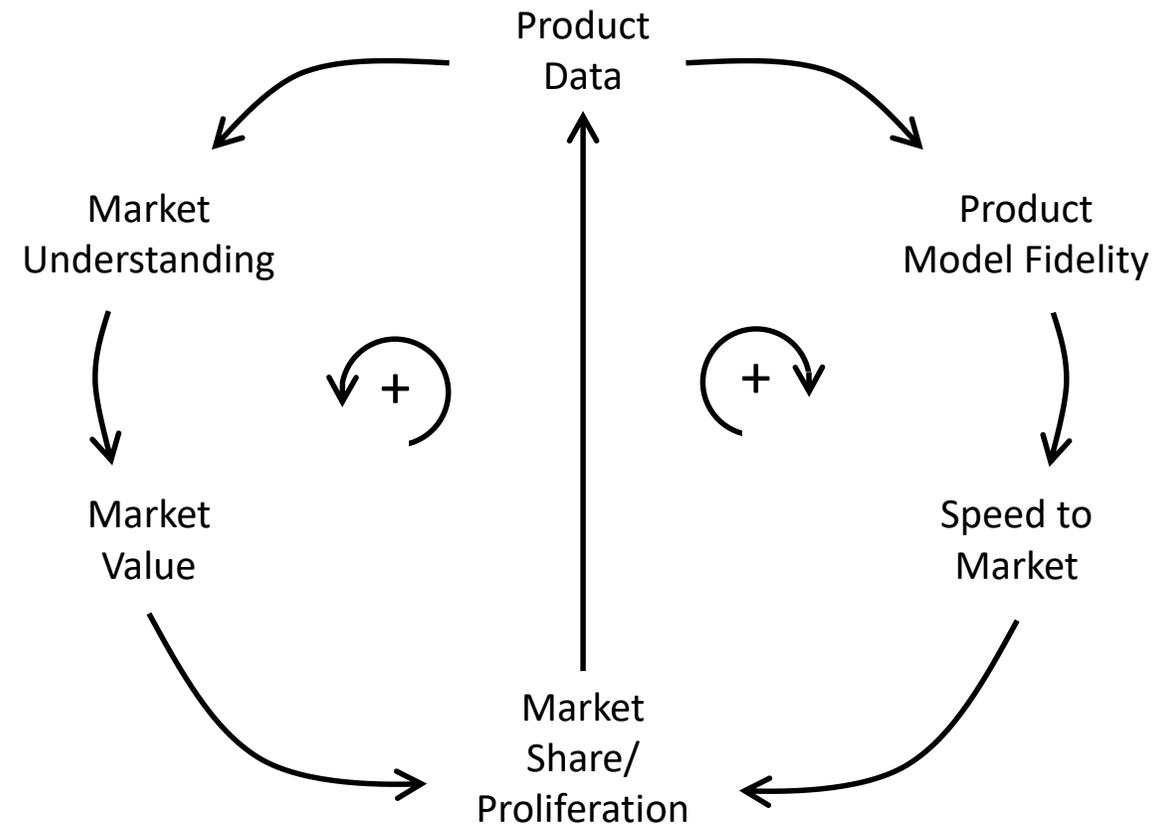
OPINION | COMMENTARY

Models Will Run the World *Steven Cohen, 8/19/2018*

- If software ate the world, models will run it.
- There is no shortage of hype about artificial intelligence and big data, but models are the source of the real power behind these tools.
- Their products get better, allowing them to collect more data, which allows them to build better models, making their products better, and onward.
- The software revolution has transformed business. What's next? Processes that constantly improve themselves without need of human intervention.

What happens when our models are right?

What happens when our models are wrong?



“...All models are wrong, but some are useful”

Don't confuse model size and complexity with model value:

“Since all models are wrong the scientist cannot obtain a "correct" one by excessive elaboration. On the contrary following William of Occam he should ***seek an economical description*** of natural phenomena. Just as the ability to devise simple but evocative models is the signature of the great scientist so ***overelaboration and over parameterization is often the mark of mediocrity.***”

George E. P. Box

Remember: Automating junk makes more junk automatically!

Don't be Alice: Know what you are modeling and why you are modeling it!



“Would you tell me, please,” Alice asks the cat, “which way I ought to go from here?”

“Well”, responds the Cheshire Cat, “That depends a good deal on where you want to get to.”

“Oh, I don't much care where –” says Alice.

The Cheshire Cat responds “If you don't care where you are going, then it really doesn't matter which way you go.”

**“It is not necessary to change.
Survival is not mandatory.”**

W. Edwards Deming



INCOSE's Transformation Strategic Objective:

<http://www.incose.org/about/strategicobjectives/transformation>

Engage as a Transformation Stakeholder Representative, visit:

<http://www.incose.org/about/strategicobjectives/transformation>

The Future of Systems Engineering

- Advance to address the market demands of innovation, productivity, and time to market
- Harness the power of modeling, simulation and knowledge representation
- Domain-specific standard vocabularies, to meet increasingly diverse stakeholder community.
- The methods and tools will also keep pace with system complexity
- Drive out unnecessary complexity through well-founded architecting and deeper system understanding.

Systems Engineering Body of Knowledge

- Systems engineering knowledge and practices will be grounded in...mathematics and science.
- Knowledge and practices will be defined and codified in domain-specific guidance and standards.

Virtual Engineering – Part of the Digital Revolution.

- Model-based approaches will extend beyond product modeling to enterprise-level modeling and analysis.



Transforming Systems Engineering



Troy Peterson

Vice President

tpeterson@systemxi.com

844.SystemXi

313.806.3929

Troy Peterson, SSI Vice President, and INCOSE Transformation lead is a recognized leader in developing model based solutions to speed innovation and solve complex systems challenges. He has led the delivery of numerous complex systems and methodologies while at SSI, Booz Allen and Ford Motor Company. His experience spans academic, non-profit, commercial and government environments across all lifecycle phases. Troy received a BS in Mechanical Engineering from Michigan State University, an MS in Technology Management from Rensselaer Polytechnic Institute and an advanced graduate certificate in Systems Design and Management from Massachusetts Institute of Technology. He also holds INCOSE CSEP, PMI PMP, and ASQ Six Sigma Black Belt Certifications.

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Standards INCOSE is Supporting

- The International Council on Systems Engineering Standards Initiatives group is one of the most active communities within INCOSE. Its members are working to advance and harmonize systems engineering standards used worldwide. INCOSE liaises with existing standards developing organizations, contributing to the development of standards and technical reports and participating in the planning for new work items related to systems engineering standards.

ISO/IEC/IEEE 15288: 2015 – Systems and software engineering -- System Life Cycle Processes

IEEE 15288.1-2014 – IEEE Standard for Application of Systems Engineering on Defense Programs

IEEE 15288.2-2014 – IEEE Standard for Technical Reviews and Audits of Defense Programs

ISO/IEC/IEEE 15289:2015 - Content of systems and software life cycle information products

ISO/IEC TR 24748-1:2010 – Guide for Life Cycle Management.

ISO/IEC TR 24748-2:2011 – Guide for Application of 15288

ISO/IEC TR 24748-3:2011 – Guide for Application of 12207

ISO/IEC 15504: 2004 - Information Technology - Process Assessment

ISO/PAS 19450:2015(en) - Automation systems and integration — Object-Process Methodology (OPM)

ISO TC184/SC5/WG1 - Object-Process Methodology (OPM) is a compact conceptual approach, language, and methodology for modelling and knowledge

ISO 10303-AP233, Industrial automation systems and integration -- Part 233: Systems engineering data representation

ANSI/GEIA EIA-632, Processes for Engineering a System, 01 Sept 2003

EIA/IS 731.1, Systems Engineering Capability Model, Electronic Industries Alliance (Interim Standard), 01 Aug 2002

IEEE 1220-2005, IEEE Standard for Application and Management of the Systems Engineering Process, Institute of Electrical and Electronics Engineers, 09 Sept 2005

And many others...

INCOSE's Transformation Strategic Objective

Objective:

INCOSE accelerates the transformation of systems engineering to a model-based discipline.

- Accelerates:
 - Understand the hype cycle¹ and bridge the chasm²...
 - Empower others to enlighten and influence adoption

- Transformation:
 - A marked change, as in appearance or character, usually for the better³. e.g. documents to models
 - Lead and support the community in crossing the chasm

- Model Based Discipline
 - System models of all types
 - Modeler Collaboration and Model Integration

1. Hype Cycle is a branded graphical presentation developed and used by IT research and advisory firm Gartner
 2. Moore, Geoffrey A. "Crossing the Chasm – and Beyond" Strategic Management of Technology and Innovation Third Edition 1996
 3. Excerpted from The American Heritage Dictionary of the English Language, Third Edition 1996 by Houghton Mifflin Company
 4. Friedenthal, Sandy and Sampson, Mark - MBSE Initiative Overview - <http://www.omgwiki.org/MBSE/doku.php>

