

INCOSE: TRANSFORMATION

Troy A. Peterson

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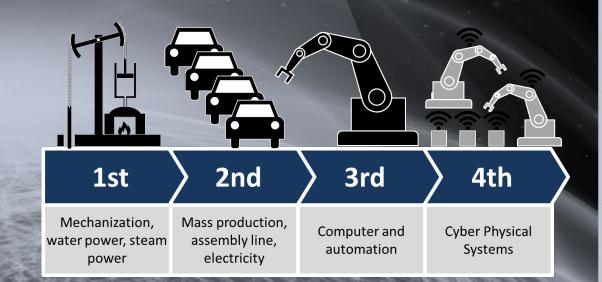
2019 INCOSE IW January 27, 2018

Digital Transformation & the Forth Industrial Revolultion

"The world is entering the Fourth Industrial Revolution. Processing and storage capacities are rising exponentially, and knowledge is becoming accessible to more people than ever before in human history. The future holds an even higher potential for human development as the full effects of new technologies such as the Internet of Things, artificial intelligence, 3-D Printing, energy storage, and quantum computing unfold."

The Global Information Technology Report Innovating in the Digital Economy World Economic Forum WORLD ECONOMIC FORUM

COMMITTED TO MPROVING THE STATE OF THE WORLD



Systems Engineering

The Essence of the Next Industrial Revolution



Deep Shift INCOSE Technology Tipping Points and Societal Impact



COMMITTED TO IMPROVING THE STATE OF THE WORLD

The Six Megatrends

As a foundation to its work, the council sought to identify the software and services megatrends which are shaping society, and their associated opportunities and risks.

People and the internet

How people connect with others, information and the world around them is being transformed through a combination of technologies. Wearable and implantable technologies will enhance people's "digital presence", allowing them to interact with objects and one another in new ways.

Computing, communications and storage everywhere

The continued rapid decline in the size and cost of computing and connectivity technologies is driving an exponential growth in the potential to access and leverage the internet. This will lead to ubiquitous computing power being available, where everyone has access to a supercomputer in their pocket, with nearly unlimited storage capacity.

The Internet of Things

Smaller, cheaper and smarter sensors are being introduced - in homes, clothes and accessories, cities, transport and energy networks, as well as manufacturing processes.

Artificial intelligence (AI) and big data

Exponential digitization creates exponentially more data about everything and everyone. In parallel, the sophistication of the problems software can address, and the ability for software to learn and evolve itself, is advancing rapidly. This is built on the rise of big data for decision-making, and the influence that AI and robotics are starting to have on decision-making and jobs.

The sharing economy and distributed trust

The internet is driving a shift towards networks and platform-based social and economic models. Assets can be shared, creating not just new efficiencies but also whole new business models and opportunities for social selforganization. The blockchain, an emerging technology, replaces the need for third-party institutions to provide trust for financial, contract and voting activities.

The digitization of matter

Physical objects are "printed" from raw materials via additive, or 3D, printing, a process that transforms industrial manufacturing, allows for printing products at home and creates a whole set of human health opportunities.

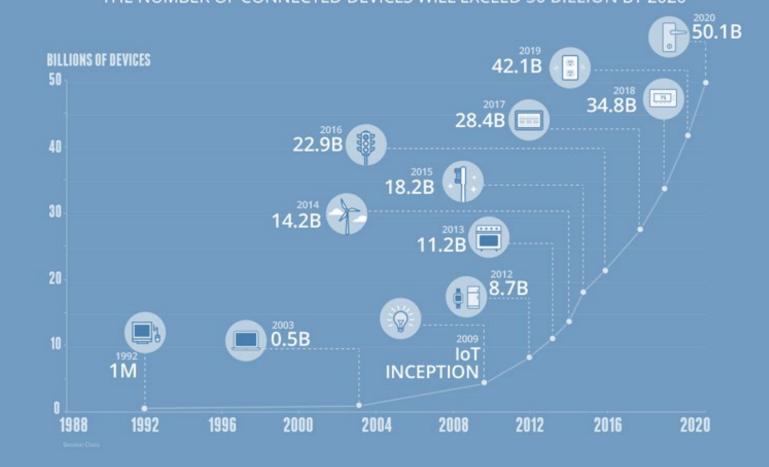


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INCOSE Trends: Internet of Things

The interconnection of products is ubiquitous, occurring across domains and with systems we use every day creating a complex web of interdependent systems.

GROWTH IN THE INTERNET OF THINGS







Analytics – Data Science - Visualization/Navigation: Improving Systems and Shared Human Understanding Across Stakeholders



INCOSE Trends: Cyber-Physical Systems & Security

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Cyber-Physical Systems Intertwining cyber and physical, vast state space, new vulnerabilities

Dance problems,

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INCOSE Trends: Artificial Intelligence

Augmented Intelligence Human, Machine interactions solving complex problems



INCOSE Trends: Industrial Revolution / Industry 4.0

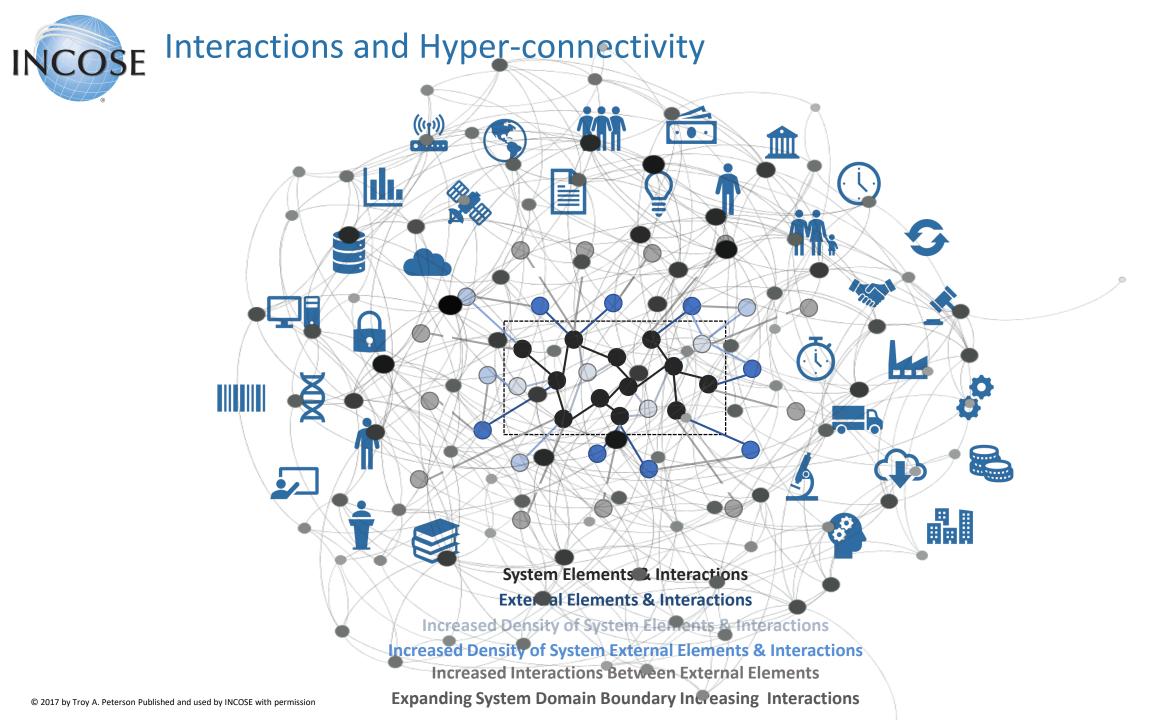
Industry 4.0 / Industrial Internet Connecting models across the lifecycle

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High Performance Computing High Fidelity System Simulations, Available/Continuous Computing Power...





Complexity and Rate of Change

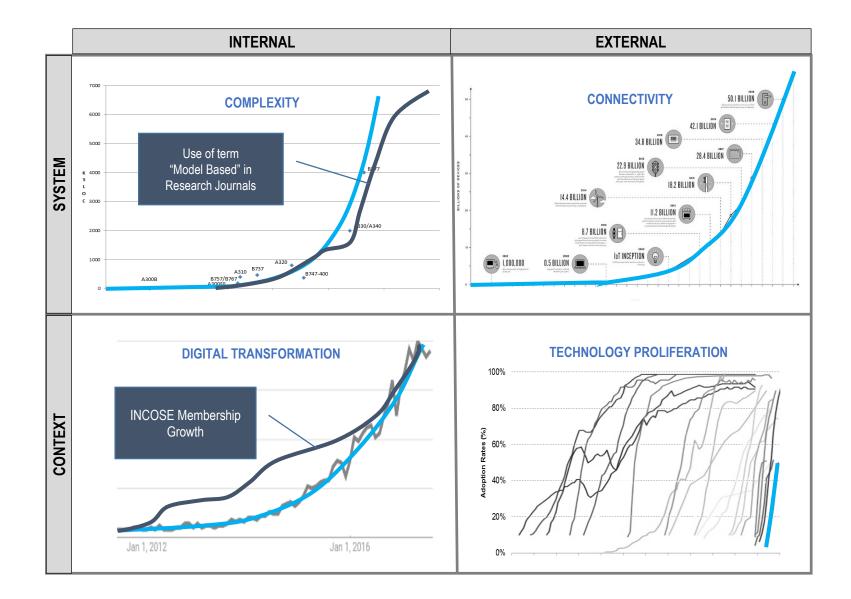
"Today more and more design problems are reaching insoluble levels of complexity."

"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.

1. Christopher Alexander, "Notes on the Synthesis of Form" Harvard University Press, Cambridge Massachusetts, 1964





"When the rate of external change exceeds the rate of internal change, the end of your business is in sight."

Jack Welch



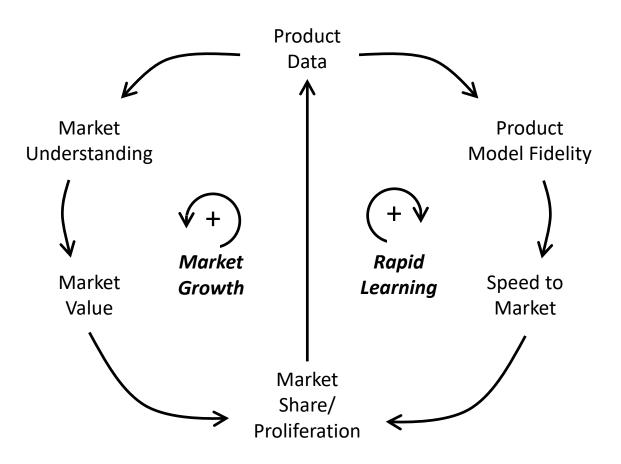
What's Required to Better Integrate Technology and More Swiftly Adapt?

THE WALL STREET JOURNAL

Models Will Run the World

By Steven A. Cohen and Matthew W. Granade – August 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.





Transforming Systems Engineering



Vision25

Systems engineering will lead the effort to **drive out unnecessary complexity** through well-founded architecting and deeper system understanding

A virtual engineering environment will incorporate modeling, simulation, and visualization to support all aspects of systems engineering by enabling improved prediction and analysis of complex emergent behaviors.

Composable design methods in a virtual environment **support rapid, agile and evolvable designs of families of products**. By combining formal models from a library of component, reference architecture, and other context models, different system alternatives can be quickly compared and probabilistically evaluated. **From:** Model-based systems engineering has grown in popularity as a way to deal with the limitations of document-based approaches, but is still in an early stage of maturity similar to the early days of CAD/CAE.

To:Formal systems modeling is standard practice for specifying, analyzing, designing, and verifying and is fully integrated with other systems. engineering models. System models are adapted to the application domain, and include a broad spectrum of models for representing all aspects of systems. The use of internet-driven knowledge representation and immersive technologies enable highly efficient and shared human understanding of systems in a virtual environment that span the full life cycle from concept through development, manufacturing, operations, and support.



Transforming Systems Engineering



Vision25

Leveraging Technology for Systems Engineering Tools



Immersive technologies support data visualization

Advanced search query, and analytical methods support reasoning about systems





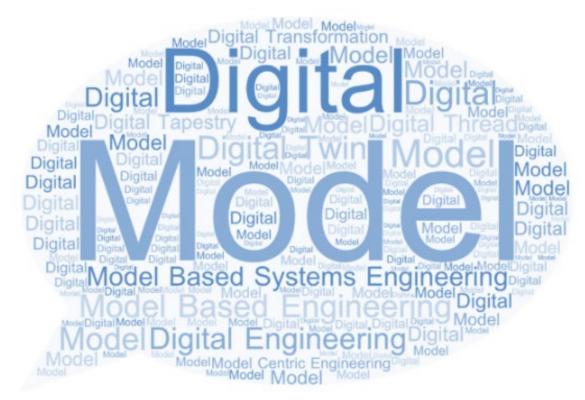
From: Current systems engineering tools leverage computing and information technologies to some degree, and make heavy use of office applications for documenting system designs. The tools have limited integration with other engineering tools.

To: The systems engineering tools of 2025 will facilitate systems engineering practices as part of a fully integrated engineering environment. Systems engineering tools will support high fidelity simulation, immersive technologies to support data visualization, semantic web technologies to support data integration, search, and reasoning, and communication technologies to support collaboration. Systems engineering tools will benefit from internet-based connectivity and knowledge representation to readily exchange information with related fields. Systems engineering tools will integrate with CAD/CAE/PLM environments, project management and workflow tools as part of a broader computer-aided engineering and enterprise management environment. The systems engineer of the future will be highly skilled in the use of IT-enabled engineering tools.



What is Model-Driven, MBSE, DE?

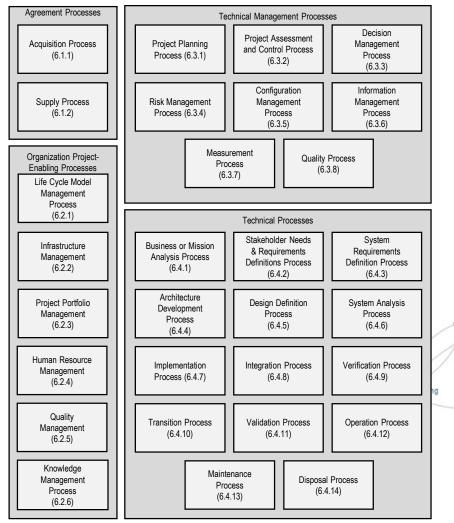
- What do we mean by:
 - Model Based Systems Engineering
 - Model Based Engineering
 - Model Based Development
 - Model Based Design
 - Model Centric Engineering
 - Model Based Methods
 - Digital Engineering
 - Digital Design
 - Digital Thread
 - Digital Twin
 - Digital Tapestry
 - Et al.

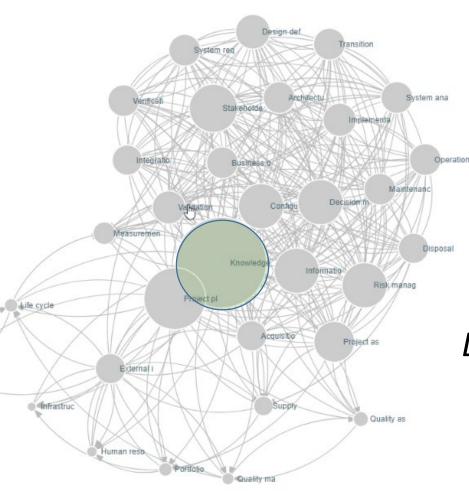






Model Based Systems Engineering Scope





Systems Engineering the central cohesive discipline essential Digital Transformation

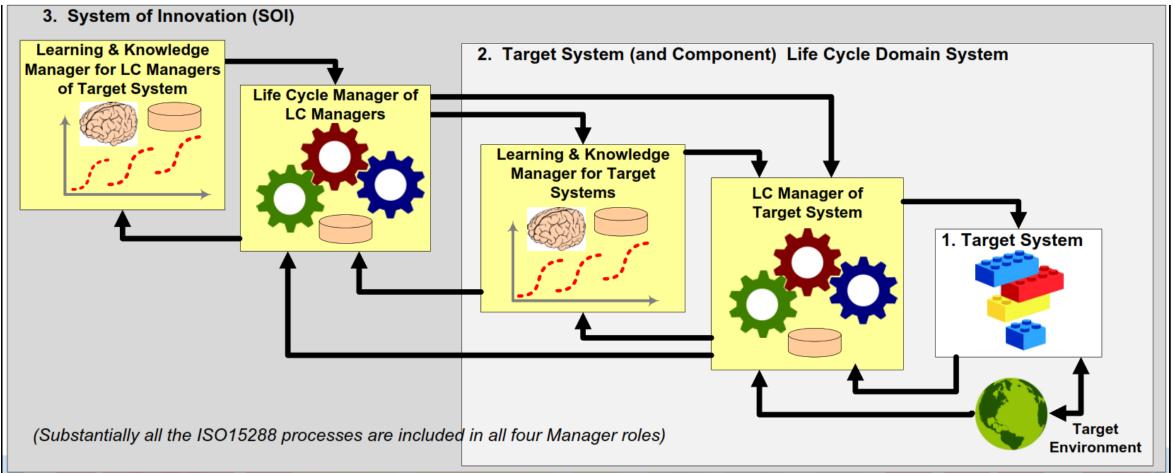
ISO 15288

Graph of ISO 15288 Process Area interactions from INCOSE Handbook



Transformation through knowledge capture and application

Agile Systems Engineering Life Cycle Management Pattern





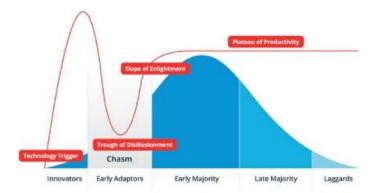
INCOSE's Transformation Strategic Objective

Objective:

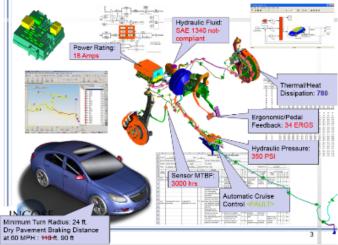
INCOSE <u>accelerates</u> the <u>transformation</u> of systems engineering to a <u>model-based discipline</u>.

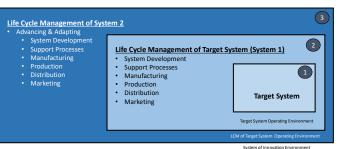
- Accelerates:
 - Understand the hype cycle¹ and bridge the chasm²...
 - Empower others to enlighten and influence adoption
- Transformation:
 - A marked change, as in appearance or character, usually for the better³. e.g. documents to models
 - Lead and support the community in crossing the chasm
- Model Based Discipline
 - System models of all types
 - Modeler Collaboration and Model Integration

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



Integrated Systems Engineering Vision







Model Based Discipline: The Next Evolutionary Step

Model Based Discipline

- Models are not new to us
- In some ways we're going "back to the future"
- Transformation is not a wholesale change
- Model based is the next evolutionary step
- A transformation whose time has come

Understand the Current State

• Take inventory of current state of transition and progress toward becoming a model based discipline

Envision and define the future state of SE:

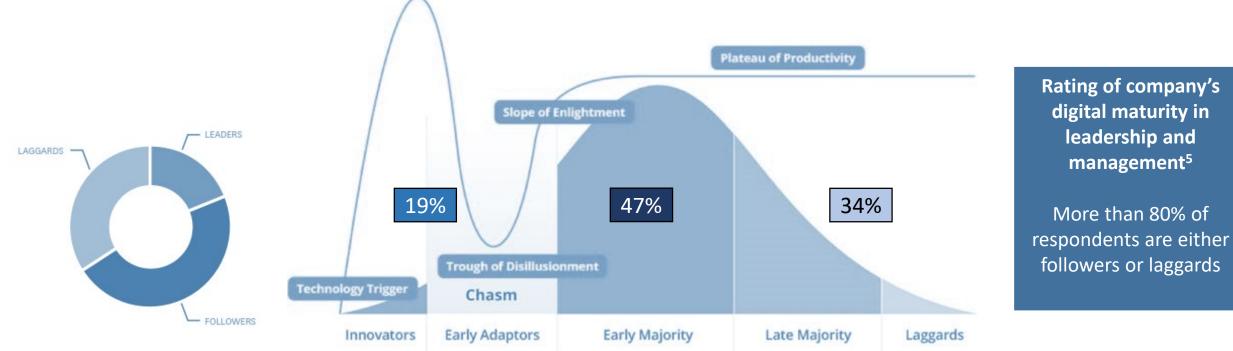
• See Vision 2025, what are the business objectives, metrics, stakeholders, technologies, priorities etc.



"Make sure that those, 'Ideas whose time has come', get launched today."



Accelerating: Technology Adoption – Hype and Chasm



Acceleration is very much about sharing, communicating and learning

Where would you plot your organization today?

leadership and management⁵ More than 80% of

^{1.} Hype Cycle is a branded graphical presentation developed and used by IT research and advisory firm Gartner

^{2.} Hype Cycle Graphic: https://en.wikipedia.org/wiki/Hype_cycle

^{3.} Moore, Geoffrey A. "Crossing the Chasm – and Beyond" Strategic Management of Technology and Innovation Third Edition 1996

^{4.} Hype Cycle, Chasm Combined Graphic: http://www.datameer.com/blog/big-data-analytics-perspectives/big-data-crossing-the-chasm-in-2013.html

^{5.} Driving Digital Transformation: New Skills for Leaders, New Role for the CIO, Harvard Business Review



Transformation: Driving Digital Transformation¹

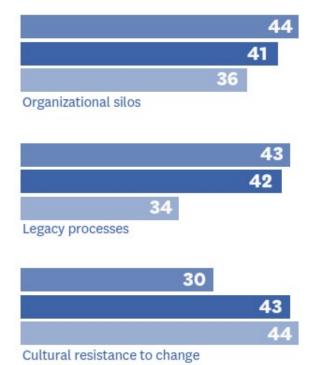
Keys to Digital Transformation (HBR Report)

- Start from the customers perspective
- Digital leadership starts at the top
- Engage in a discussion of trends
- Think about agile
- Use examples to make it real
- Need a foundation of trust
- Use KPIs for sharing knowledge
- Break down walls wherever possible
- Need digital coaches or maters
- Create appropriate learning forums

KEY BARRIERS TO DIGITAL BUSINESS DEVELOPMENT

Percentage who said, when it comes to digital business, these are the primary issues holding their organization back. [CHECK UP TO THREE]

LEADERS • FOLLOWERS • LAGGARDS



1. Driving Digital Transformation: New Skills for Leaders, New Role for the CIO, Harvard Business Review



Transformation: INCOSE CAB MBSE Top Enablers, Needs and Obstacles

Documents to Models

Enablers

- Translate models into decision maker language
- Ability to analyze quickly, proper level of fidelity
- Change management best practices

Needs

- Models need to answer stakeholder questions
- Connect modeling to programmatic success
- Demonstration how modeling speeds innovation

Obstacles

- Why change, what is the ROI
- Inability to know if model used is reliable; VVUQ
- Up front costs in resources, time to learn etc.

Process / Methods

Enablers

- Clearly demonstrate the value of system model(s)
- Models uncover errors in existing artifacts
- · Aid an early adopter with a pain point

Needs

- Systems engineering and domain ontologies
- Common MBSE methods and practices
- Better ability to review model quality/accuracy

Obstacles

- Contracting and policy
- Use of requirements documents versus models
- Benefits are not obvious but they should be

Model Based ROI

Enablers

- Seeing through the "Mystique" of MBSE
- Framework to view ROI by process area
- Capitalizing models as intellectual property

Needs

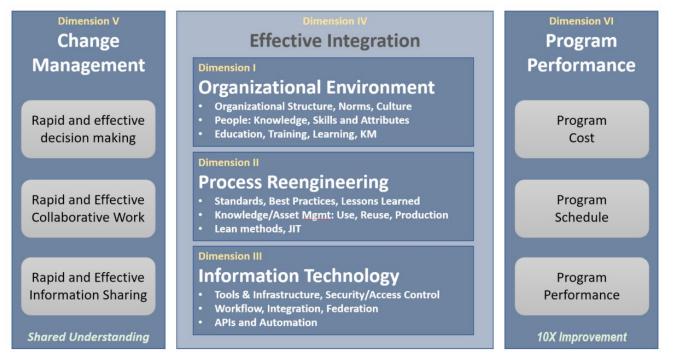
- Baseline to compare MBSE application Viewpoint of ROI from multiple stakeholders
- Covering all of ISO 15288 process areas

Obstacles

- Weak Systems Eng. foundation for MBSE
- Lack of understanding; one size does not fit all
- Expressing "Soft" versus "Hard" ROI for MBSE



Transformation: Change Management and Leadership



Integrate dimensions of change Addresses dimensions in parallel Concurrency and dimensional trades Build grass-roots ownership Obtain top leadership support

Consider:

ABP = CM(OE + PR + IT)

- ABP = Achieving Breakthrough Performance
- OE = Organizational Environment
- BPR = Business Process Reengineering
- IT = Information Technology
- CM = Change Management

Transformation is very much a people focused endeavor.

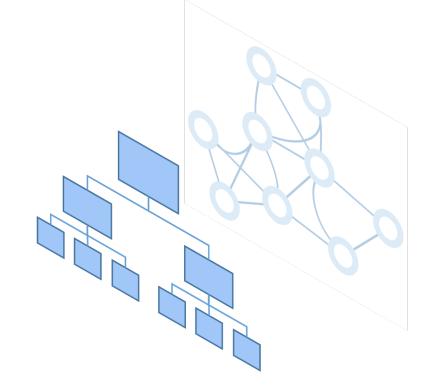
Organizational Transformation and Creating a Sense of Urgency

John P. Kotter: Leading Change –

Eight-Step Process for undertaking major change.

1. Creating a Sense of Urgency

- 2. Building a Guiding Coalition
- 3. Developing a Strategic Vision and Initatives
- 4. Expanding the Network of Change Agents
- 5. Empowering Broad-Based Action
- 6. Generating Short-Term Wins
- 7. Consolidating Gains and Producing More Change
- 8. Instituting Change in the Culture



John P. Kotter: Accelerate - In Kotter's new book Accelerate

he refines principals and adds the concept of a "dual operating system".

- One operating system is characterized by management, hierarchy and driven toward efficiency
- The other is characterized by leadership, networks, strategic acceleration and driven to innovate.
- Operating systems align nicely with the System of Innovation framework used in INCOSE's Agile and Patterns Working Groups where we see the distinct roles of executing and managing systems development and managing knowledge and what is learned in execution.



Transformation Strategy Overview

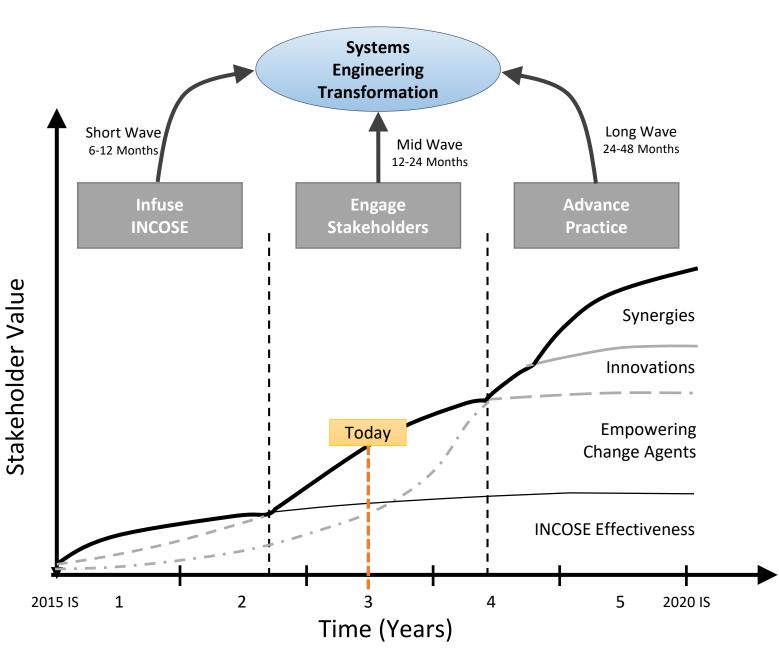
- Vision
- Mission
- Mission Areas
- Goals
- Objectives

Vision	Systems Engineering is acknowledged as a model based discipline					
Mission	INCOSE accelerates the transformation of systems engineering to a model-based discipline					
Mission Area #	1	2	3			
Mission Area	Infuse INCOSE	Engage Stakeholders	Advance Practice			
Mission Area	What can INCOSE Do?	What is practiced and needed?	What is possible?			
Goals	Infuse model based methods throughout INCOSE products, activities and WGs	Engage stakeholders to assess the current state of practice, determine needs and values of model based methods	Advance stakeholder community model based application and advance model based methods.			
<i>Objective 1</i> Foundations	Inclusion of model based content in INCOSE existing/new products (Vision, Handbook, SEBoK, Certification, Competency Model, etc.)	Define scope of model based systems engineering with MBE practice and broader modeling needs	Advance foundational art and science of modeling from and best practices across academia, industry/gov. and non profit.			
Objective 2 Expand Reach	Expand reach within INCOSE of MBSE Workshop; highlight and infuse tech ops activities with more model based content (products, WGs etc.)	Identify, categorize and engage stakeholders and characterize their current practices, enablers and obstacles	Increase awareness of and about stakeholders outside SE discipline of what is possible with model based methods across domains and disciplines (tech/mgmt)			
Objective 3 Collaborate	Outreach: Leverage MOUs to infuse model based content into PMI, INFORMS, NAFEMS, BIM, ASME and others, sponsoring PhD Students, standardization bodies, ABET	Build a community of Stakeholder Representatives to infuse model based advances into organizations practicing systems engineering.	Initiate, identify and integrate research to advance systems engineering as a model based discipline			
Objective 4 Assessment/ Roadmap	Assess INCOSE's efforts (WG, Objectives, Initiatives etc.) for inclusion of model based methods across the Systems Modeling Assessment/Roadmap	Engage stakeholder community with Systems Modeling Assessment/ Roadmap to better understand the state of the practice of MBSE. Push and pull content from stakeholders (change agents and the "to be convinced")	Provide baseline assessment framework, Systems Modeling Roadmap, to create a concrete measure of current state of the art of what's possible/what's the potential. 26			

28 January 2019



- Mission Areas
- Internal Short Wave
- External Mid Wave
- Advancing Long Wave
- Waves Run Concurrently
- Activities build on each other
- Important to fully engage stakeholder this next year. Pilot Assessment & Roadmap this CY and kick-off more broadly at 2017





Transformation – Objectives & Initiatives

New/Related Developments

- Organizational Change Management
- MBSE FAQs Development
- Using MBSE Initiative as SE Innovation Incubator
- Collaborative V&V of models in effort with ASME
- Establishing new and expanded MOUs

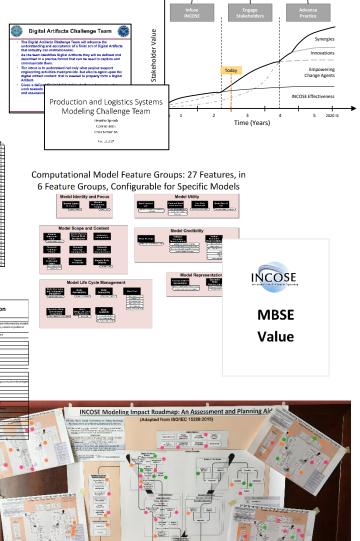
Products Under Development

- Model Based Exemplars
- INCOSE MBSE Primer
- Value Briefing / Case Studies / ROI
- ST4SE: SE Semantic Technologies/Ontology

Accomplishments

- INCOSE IS MBSE Lightening Rounds
- Transformation Paper
- Model Wrapper / Features
- INCOSE Transformation Webinar
- Assessment Roadmap
- Stakeholder List
- Enablers & Roadblocks
- Strategy & Action Plan
- Web search improvements
- Transformation website created
- Integration of MBSE throughout IW
- Many Transformation Briefings







INCOSE Transformation Stakeholders



- Engineering Executives
- Policy Makers
- Academics & Researchers
- Practitioners
- Tool Vendors

This vision will continue to evolve based on stakeholder inputs and on-going collaborations with professional societies.



Model Consumers (Model Users cal stakeholders in various Systems of Interest, who acquire / make decisions about / make use of those systems, and are informed by mode them. This includes mass market consumers, policy makers, business and other leaders and executives, investors, product users, voters in public or

Stakeholders in A Successful MBSE Transformation

te elections or selection decisions, etc lel users, including designers, project leads, production engineers, system installers, maintainers, and users/operators

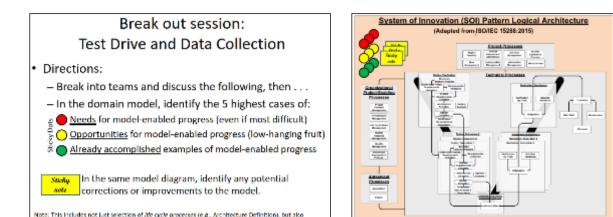
would c	reators (including woder improvers):
*	Product visionaries, marketers, and other non-technical leaders of thought and organizations
•	Systems Engineering practitioners, system technical specifiers, engineers, designers, testers, theoreticians, analysts, scientists
*	Students (in school and otherwise) learning to describe and understand systems
*	Educators, teaching the next generation how to create with models
*	Academics & Researchers who advance the practice
*	Those who translate model content/information into formalized models/structures etc.
	<pre>clea Communicators;</pre>
**	Marketing professionals
**	Academics/Educators, especially in complex systems areas of engineering and science, public policy, other domains, and including curriculum developers
	as well as teachers
**	Leaders of all kinds
**	Leaders responsible to building their organization's MBSE capabilities and enabling MBSE on their projects
Model II	nfrastructure Providers, Including Tooling, Language and Other Standards, Methods:
*	Suppliers of modeling tools and other information systems and technologies that house or make use of model-based information
•	Methodologists, consultants, others who assist individuals and organizations in being more successful through model-based methods
•	Standards bodies (including those who establish modeling standards as well as others who apply them within other standards)
INCOSE	and other Engineering Professional Societies
*	As a deliver of value to its membership
*	As seen by other technical societies and by potential members
*	As a great organization to be a part of
	As promoter of advance and practice of systems engineering and MBSE

Model Consumers Model Creators Complex Idea Communicators Model Infrastructure Providers INCOSE and other Professional Societies



INCOSE CAB Breakout: Assessment / Roadmap Instrument:

- Intentionally very simple:
 - Focused "one level down" from the intention to apply model-based methods to SE.
 - Level of detail = the individual ISO 15288 life cycle processes.
- Intended to address these <u>important</u> <u>questions</u>:
 - What are you trying to improve? (Which 15288 processes?)
 - Where are the biggest potential gains? The easiest potential gains?
 - What is already improved?
- But <u>not</u>:
 - <u>How</u> will your goals be accomplished?
 - What are the <u>details</u> of your plan?
 - Not a CMMI



no/os (e.g., Product, Manufacturing, Distribution, Service, Enterprise, etc.

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INCOSE/ASME Model Stakeholder Features Pattern

- Being created in the INCOSE supported ASME VV50 standards committee project, also in use in the INCOSE Transformation effort.
- Metadata in the form of a model itself, describing "what is in the model" – like a barcode which describes a product.
- 29 Model Features, spread across 6 feature groups

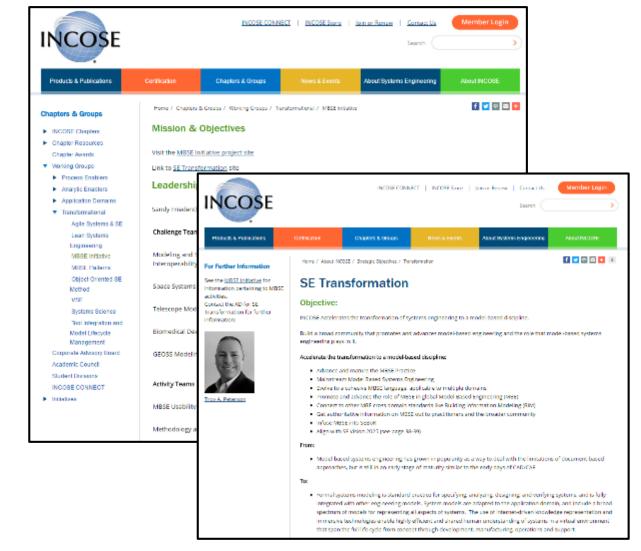
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Model Scope and Content	Model Credibility
Modeled Medeled System Explanatory Failure Modes Stakeholder External (Black Decomposition and Effects Value Box) Behavior	Wodel Envelope Validated Conceptual Model Credibility Verified Executable Model Credibility (woos: weucation Envelope) Quantization Accuracy Reference Quantization Accuracy Reference
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MBSE Workshop and Relate	ings at INCOSE	(Jan. 28 - 31) + MBSL Workshop Objectives			
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Driven by the INCOSE Board's strategic objective to become	e a 'model-ba	sed discipline ' the Systems		anuary 28, 2017	1
Engineering Transformation effort and Model Based System				nuary 29, 2017	
expand upon the highly successful MBSE Workshop, nov			 Monday, Ja 	nuary 30, 2017	
to the International Workshop (IW) 2016, MBSE will be a	MBSE	Workshop Schedule			
the MC In alignment with the INCOSE's Systems Enginee			and the second second		Stated in the Tax Course
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This page provides an overview of the MBSE-related info	Links to pres	entidions will be added to the agenda items below as they b	come available.		
IW. Each group is encouraged to maintain a meeting pag	Saturday,	January 28, 2017			
application, or INCOSE website. Presentations and other	-				
these pages.	TITE	Agenda Item Presentation Link MOSE interlie		Presenter Mark Sampson (Samari	
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MBSE Workshop Objectives		Systems Engineering Transformation Stategic Objective		They Person (SGI)	Tone (Incase Charles
Accelerate transformation of systems engineering to a m		againsted Speaker: Digital Engineering		Kristen Balavin (Jr.S. DoD DASD(SF))	
Accelerate transformation of systems engineering to a m		wirWestel-Centric Decision Making		Danna Blodes (MIT)	
 Advance and mature the MBSE Practice 		an Hown Mode-Found Systems Engineering Justified?		Ed Caroli (Sanda National Labo)	
Mainstream Model Based Systems Engineering	18.15-17.0	esi Potore Directions for Systell, v2		Sandy Friedenthal	
 Promote and advance the role of MBSE in global I 	17.00-17.40	MBSE & SynWL Education		Russel Peak (Georgia Tech)	
 Cet authoritative information on MBSE out to practice 	17 45-10:00	MDSE Workshop Wrap-up & Look shand		Mark Sampson (Senser)	a) & They Pelemon (SSI)
 Infuse model based methods throughout INCOSE Engage stakeholders to assess the current state d 	Other mount	with MOSE-related topics on Sunday tase group section below	a for deplici		
 Determine needs and value of model based methods 			a for caracter		
 Advance stakeholder community and advance mo 	Tencial	Group			
	12:10-17:40	Ted Integration and Model Lifetycle Management Workin	ig croup		
IW 2017 MBSE Schedule	Sunday, J	anuary 29, 2017			
	Tirs /	gende Hen Presentation Link	Presenter		
The following PDF file contains the arW 2017 MDSE W		IDSE Initiative & SE Transformation		pean (Siemens) & Troy P	elerator (SSI)
This agenda includes the main MBSE workshop scheduk	9.30				
linked from the tables below as they become available.		Sosing the Design Cycle Loop with Executable Requirement (SLC		n (Procler & Gamble) & h he Rouse Col)	1. Tammescheit (Nodelon) &
		PL Model-Based Systems Engineering Case Study		(NASA JPL)	
	11:00				
		NVG5 Model Oxed Systems Engineering Pathfinder 2016	6 K. Welland	A J. Holinday (NASA)	
		kummany and Path Forward			
	12:00	CSA Datilit - Case Shady	JOGE LOW	the (Duropean Space Ag	
		externe Engineering at Ford Motor Company Care Study	Christophe	Powey (Feed Mater Co	10.00 (F)
	13.33				
	13 33 1	Nodel Rosed Engineering at Roythean Core Shaty	Stephane	Chiesi (Rretheon)	
	11.03	IB3E Footysten: Overview	Lannie Van	Zand (Sedior)	
	11 33	and the second sec		and the second second	

http://www.omgwiki.org/MBSE/doku.php?id=mbse:incose_mbse_iw_2017



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



Accomplishments: Website / Discoverability Improvements

Transformational Working Groups (WG)

- Agile Systems and Systems Engineering
- Lean Systems Engineering
- Model Based Systems Engineering Initiative
- Model-based Conceptual Design
- Object-Oriented SE Method
- MBSE Patterns
- Very Small Entities (VSE)
- Systems Science
- Tools Integration & Model Lifecycle Management
- INCOSE-NAFEMS Collaboration
- Ontology

Visit site for WG charters and to learn more

http://www.incose.org/ChaptersGroups/WorkingGroups/transformational

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Chapters & Groups INCOSE Chapters Chapter Resources Chapter Awards Working Groups Analytic Enablers Application Domains Transformational Process Enablers Corporate Advisory Board Academic Council Student Divisions INCOSE CONNECT Initiatives	Home / Chapters & Transforma Working Groups Agile Systems & Lean Systems & MBSE Initiative MBSE Patterns Model Based C Object-Oriente Very Small Enti Systems Science Tool Integratio INCOSE-NAFE! Ontology Most INCOSE Worguests. Working Group C	Engineering Concept Design Ed SE Method Ities (VSE) ce n and Model Lifecycle Manage MS Collaboration orking Groups manage wor	ransformational Troy Peterson managed on the INCOSE pr ment k in process in the INCOSE	Connect library	, accessible only t	to members and invited
SE INCOSE Agile Systems and Systems Engineering WG Charter		Systems Engineering	PDF	191.16 KB	30 May, 2017	Download
	Lean Systems Engir		PDF	73.58 KB	25 Oct, 2014	Download
	Model-based Cond	-	PDF	210.54 KB	25 Oct, 2014	Download
This working preval is to identify and devicing a hody of knowledge that will inform reing and obtaind a sourcease which impairs again senses capability. Again years of working preval include hold cycle insignmenting processos and system-engineered.	Object-Oriented SE		PDF	150.84 KB	25 Oct, 2014	Download
one concepting as a serial solar series capability, evolved a velocence of by system architecture. This architecture influence spin capability as more figuration, and a solarize of series in traditionality, which deductment architig bit system to reason readers as account requirement, or deforming, information of requires a reasonable and and as accounting many methods by the system of requires a reasonable of the system of the	MBSE Patterns		PDF	933.21 KB	26 Jul, 2016	Download
mediate structure requirements officers of Medianness of medianes in medianed in response cost, response predictability, and response scope sufficient to variabilitie found intern.	Process Improveme	ent	PDF	130.54 KB	25 Oct, 2014	Download
nderstand sustainably agle splann design and project management someptic exists on an oriexant fixates	Very Small Entities		PDF	232.28 KB	07 May, 2016	Download
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		د Model Lifecycle Management		378.40 KB	07 May, 2014	Download
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MBSE Initiative as an Incubator and Transformation Agent

- Digital Artifacts Challenge Team -> Digital Engineering Information Exchange WG:
 - Identifying and characterizing MBSE digital artifacts across the lifecycle
- Augmented Intelligence in Systems Challenge Team
 - How can machine learning and AI aid systems engineering in the innovation process
- Production and Distribution Systems Challenge Team
 - Connecting models across the lifecycle Industry 4.0, Supply Chain, Logistics
- V&V of models (Potential Collaboration ASME, INCOSE, NAFEMS)
 - Verification and Validation of Models tied to ASME VV50 standards project
- Digital Engineering Capabilities Assessment
 - Developing self-assessments and gap analysis, strategic planning, project progress aids

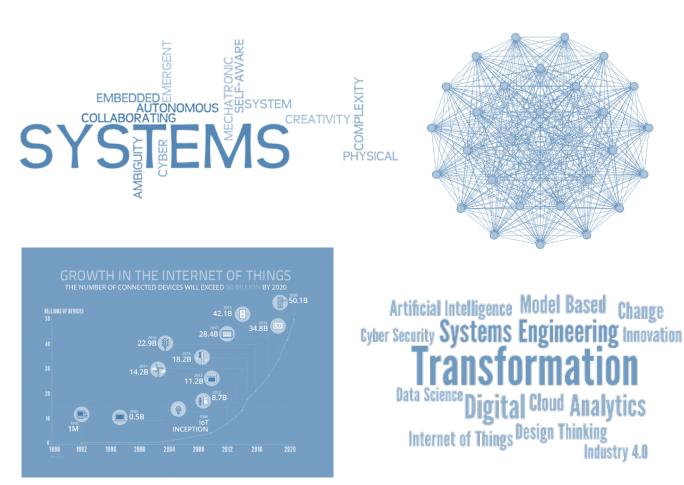


Generic	life cycle	(ISO/IEC/IEEE	15288:2015)	

Concept stage	Development stage	Production stage	Utilization stage	Retirement stage
			Support stage	



Overcoming the Challenge



Simplicity does not precede complexity but follows it. Alan Perlis (1922 – 1990)

Simplicity is complexity resolved.

Constantin Brancusi (1876-1957)

Fools ignore complexity. Pragmatists suffer it. Some can avoid it. Geniuses remove it.

Alan Perlis (1922 – 1990)

Any intelligent fool can make things bigger and more complex... It takes a touch of genius – and a lot of courage to move in the opposite direction.

Albert Einstein (1879 – 1955)

A genius! For 37 years I've practiced fourteen hours a day, and now they call me a genius!

Pablo de Sarasate (1844 – 1908)

Lesson: Endure complexity, add tireless effort, and a touch of genius...

Change

"It is not necessary to change. Survival is not mandatory." W. Edwards Deming

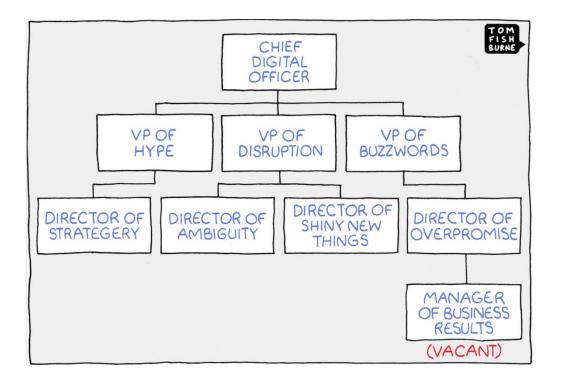


INCOSE's Transformation Strategic Objective: https://www.incose.org/about-incose/transformation

Engage as a Transformation Stakeholder Representative, visit: https://www.incose.org/about-incose/transformation



Digital States





HSPIRED BY ODT AT #E2DS BY OVOINONEN

Digital Denial

Digitally Zealous



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