



33rd Annual **INCOSE**
international symposium
hybrid event
Honolulu, HI, USA
July 15 - 20, 2023



Bringing a Knife to a Gun Fight: Systems Engineering for the Modern World

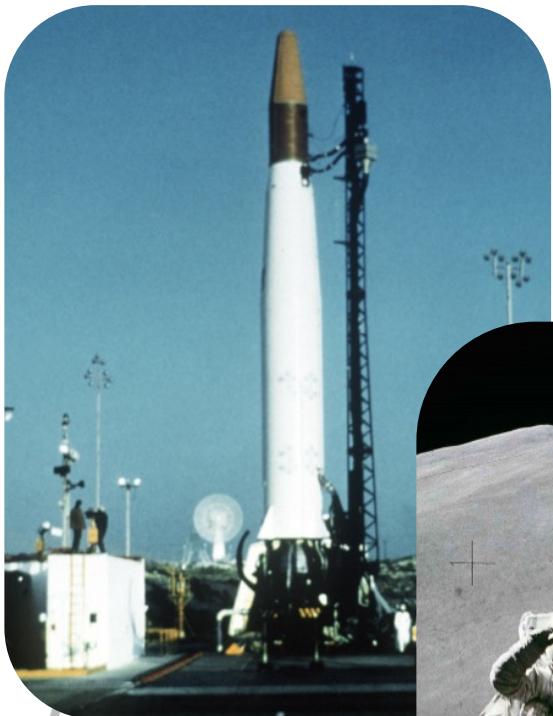
David Long, Blue Holon

Duncan Kemp, UK Ministry of Defence

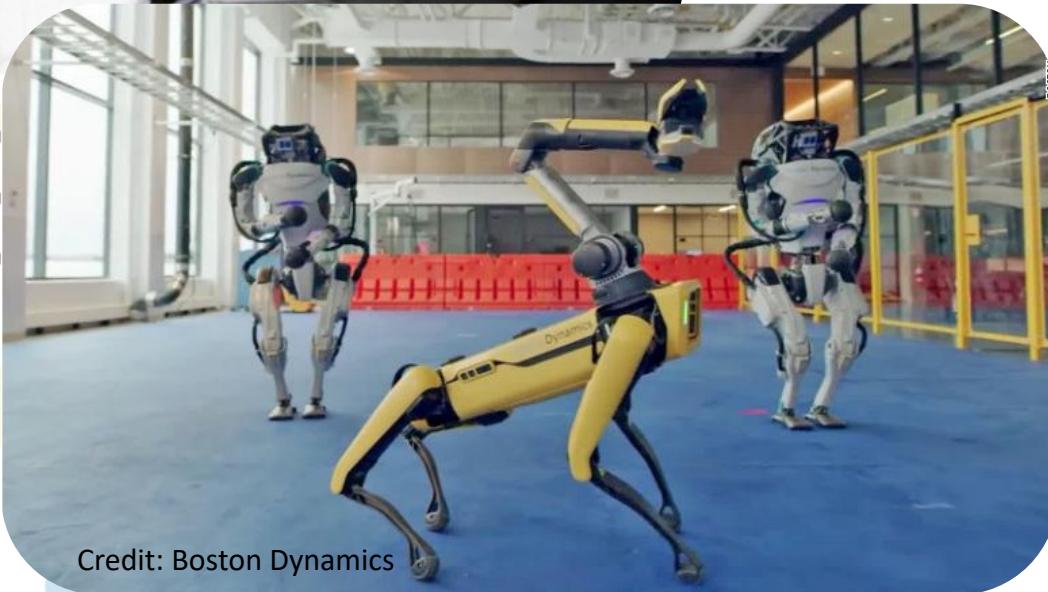
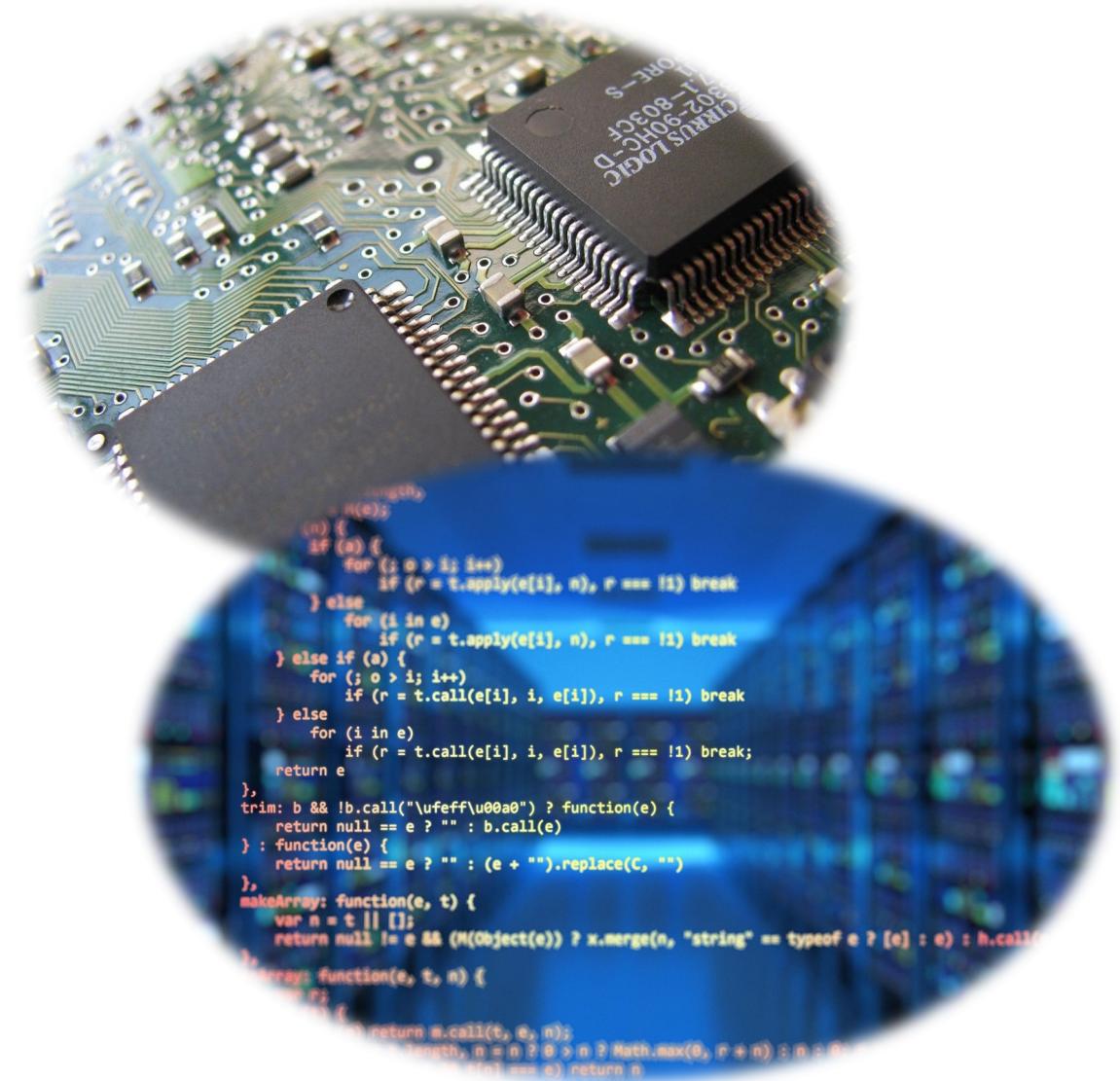
Erika Palmer, Cornell University

Jon Wade, University of California, San Diego

The “Golden Age” of Systems Engineering



Systems in the Modern World



Looking Beyond Product in the Modern World



Japan Society 5.0



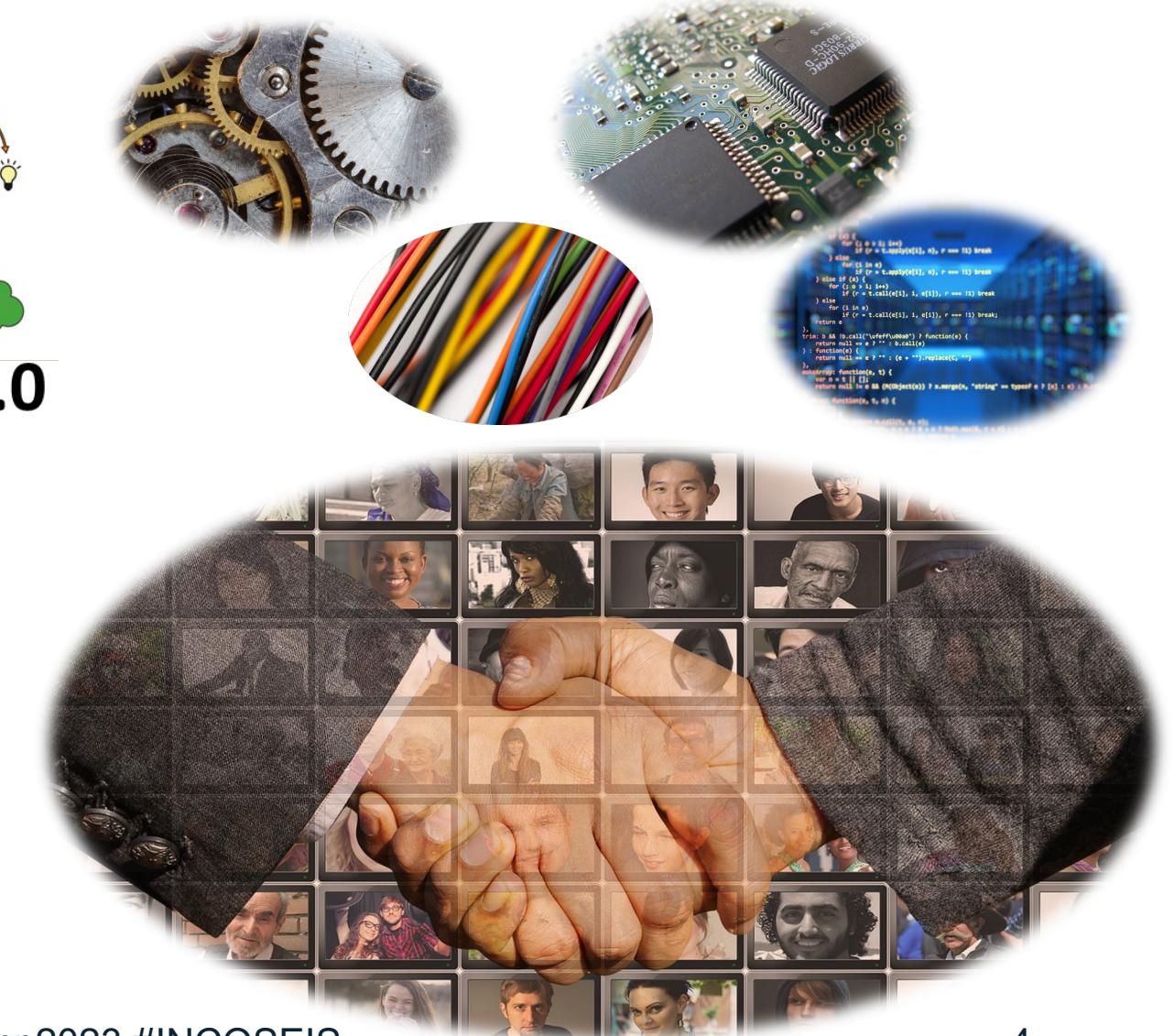
SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD

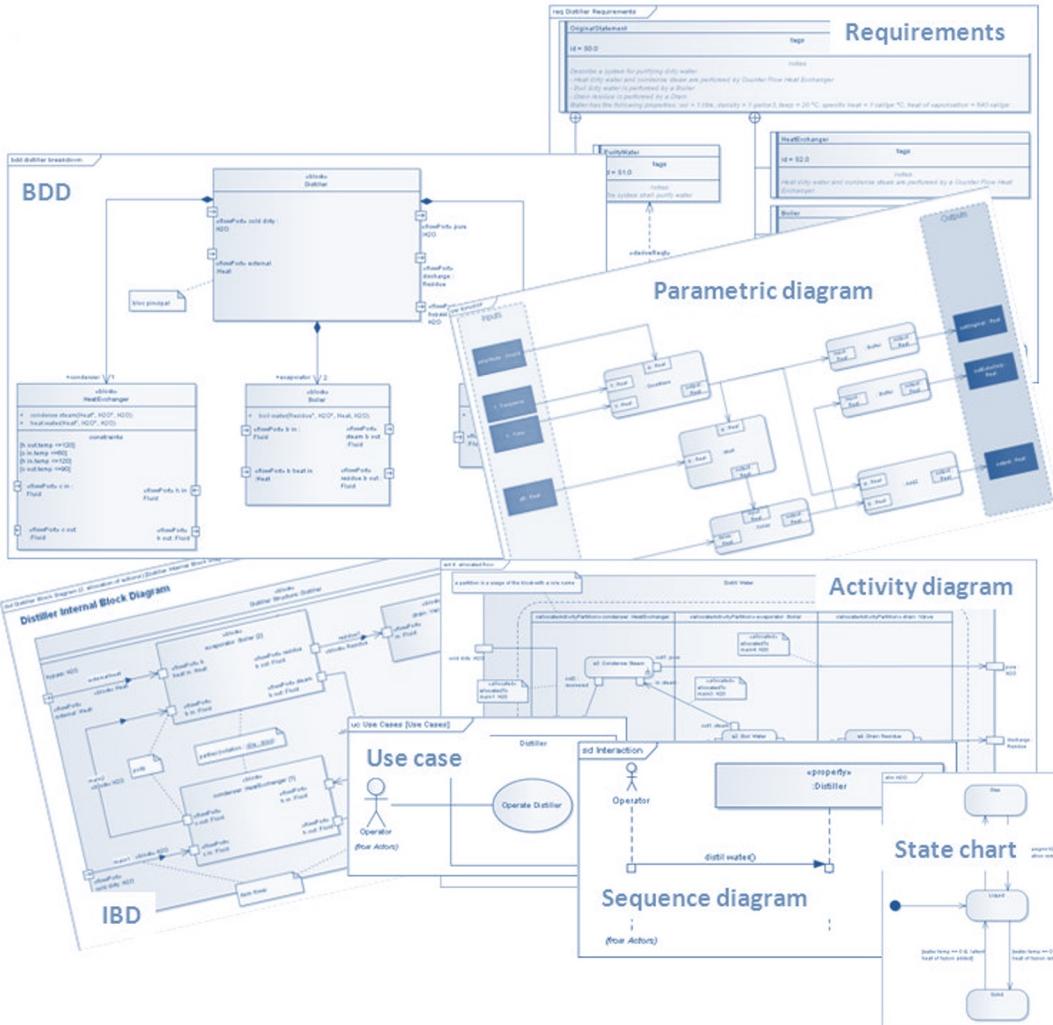


15-20 July 2023

[#INCOSEIS](http://www.incose.org/symp2023)



Embracing a Broader Foundation



Complex

the relationship between cause and effect can only be perceived in retrospect

probe - sense - respond
emergent practice

Complicated

the relationship between cause and effect requires analysis or some other form of investigation and/or the application of expert knowledge

sense - analyze - respond
good practice

novel practice

no relationship between cause and effect at systems level

act - sense - respond

Chaotic

© Cynefin framework by Dan Snowden

best practice

the relationship between cause and effect is obvious to all

sense - categorize - respond

Simple

Study of Systems



Looking Outward, Embracing Transdisciplinarity

“The whole is greater than the sum of the parts”

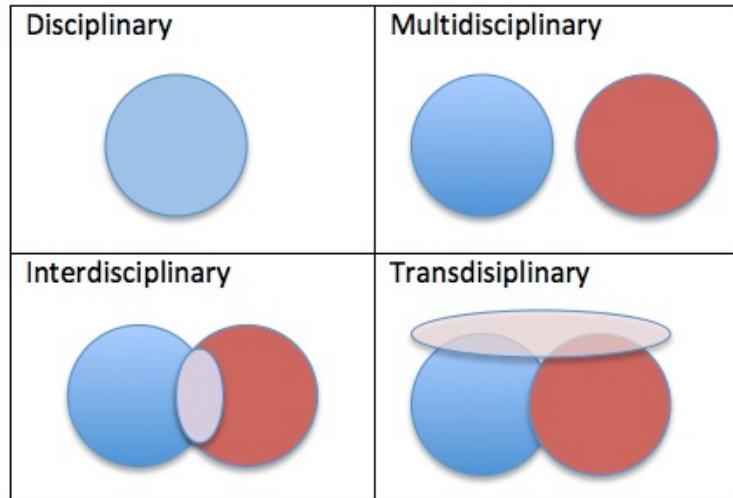


Image Credit: Magellan International School



Project

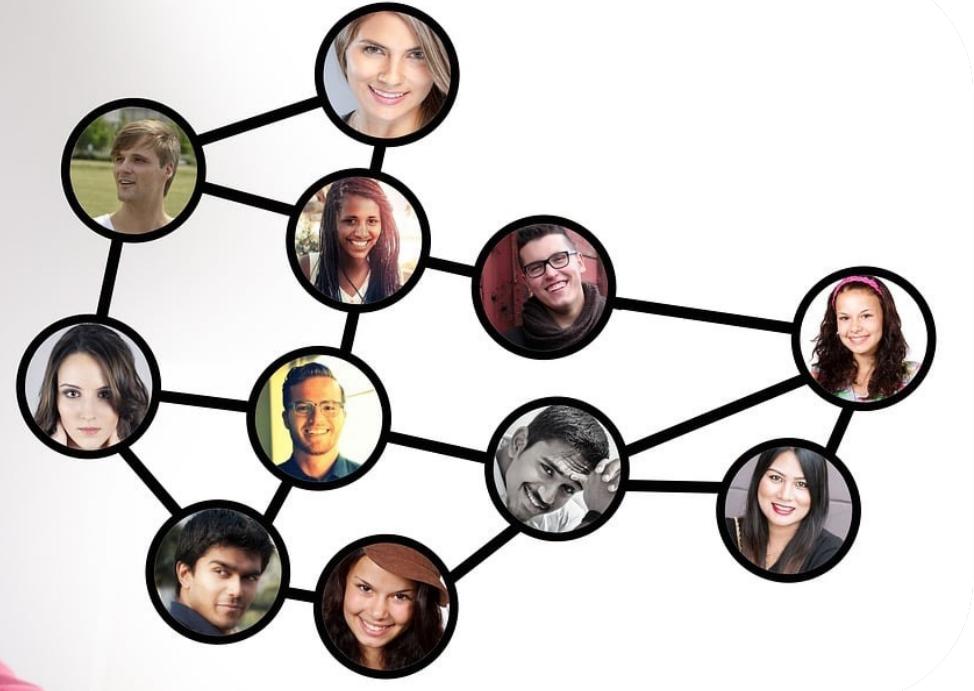


Enterprise



Academia

15-20 July 2023



In essence, radical collaboration is the requirement necessary for the human race to solve its wicked problems.

Erika Palmer

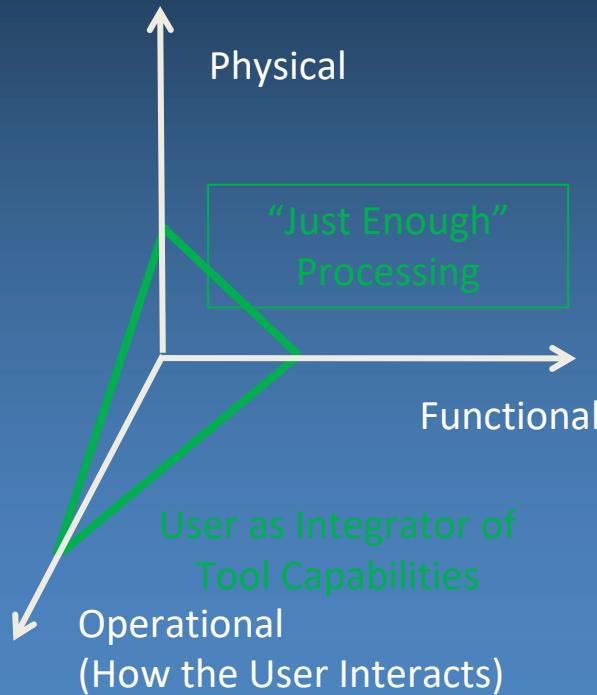


Jon Wade, University of California, San Diego

The Recontextualization of SE

Evolution of System Complexity

Past



Present

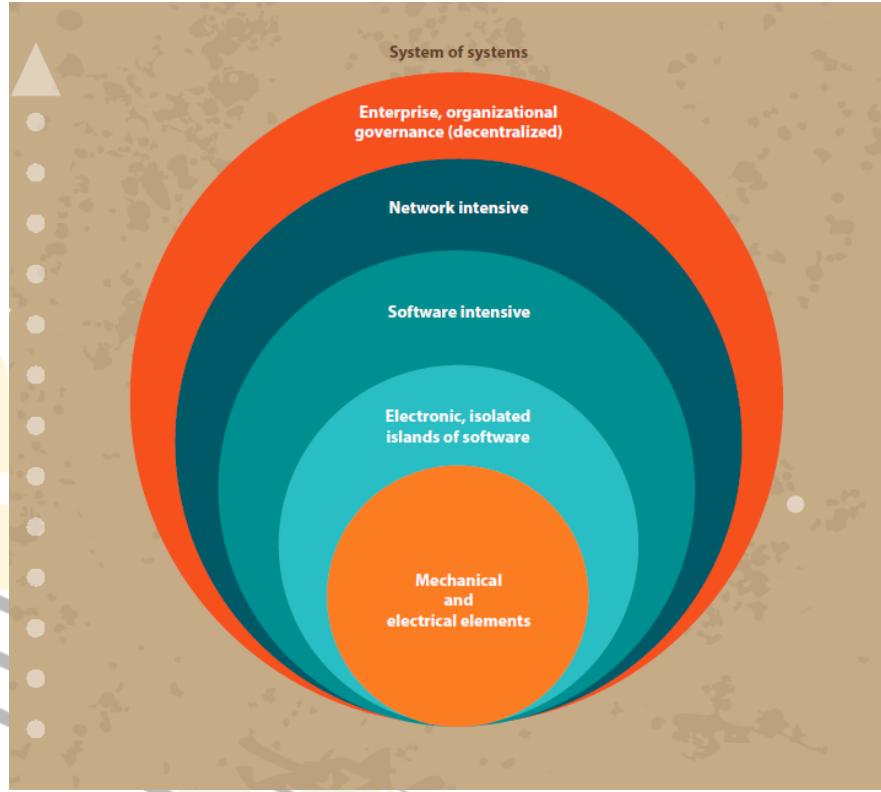
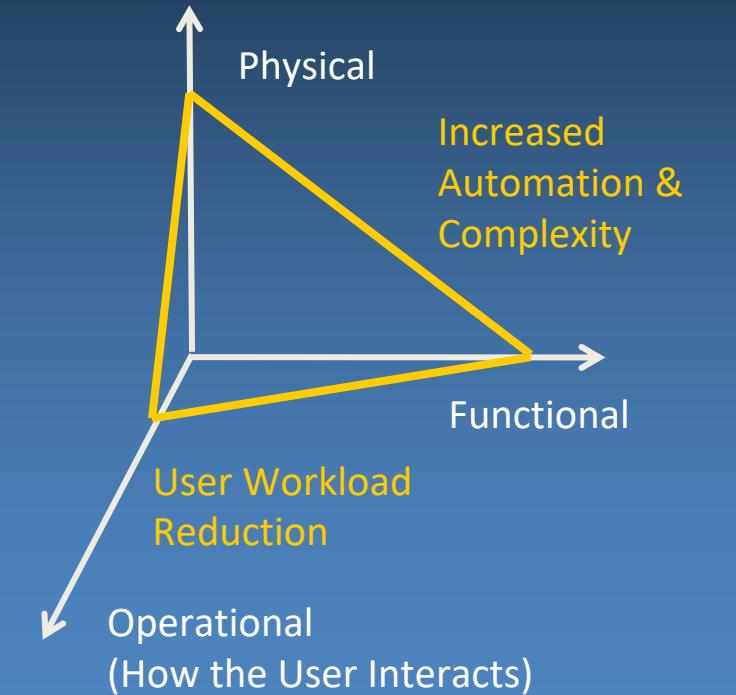


Image Credit: INCOSE Vision 2025

Collaborative Intelligence



IBM's Deep Blue

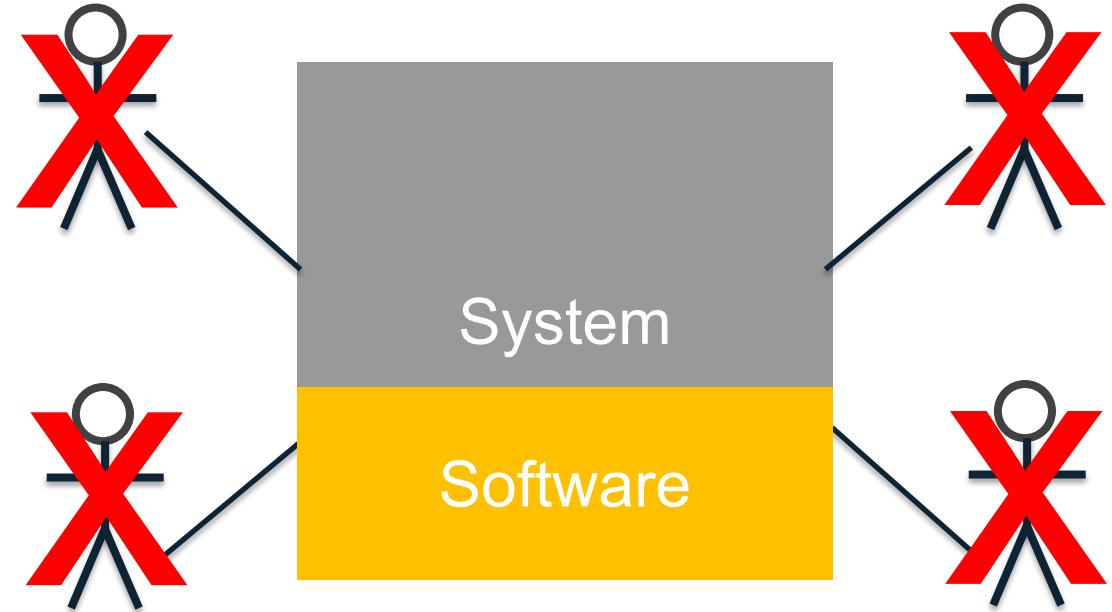
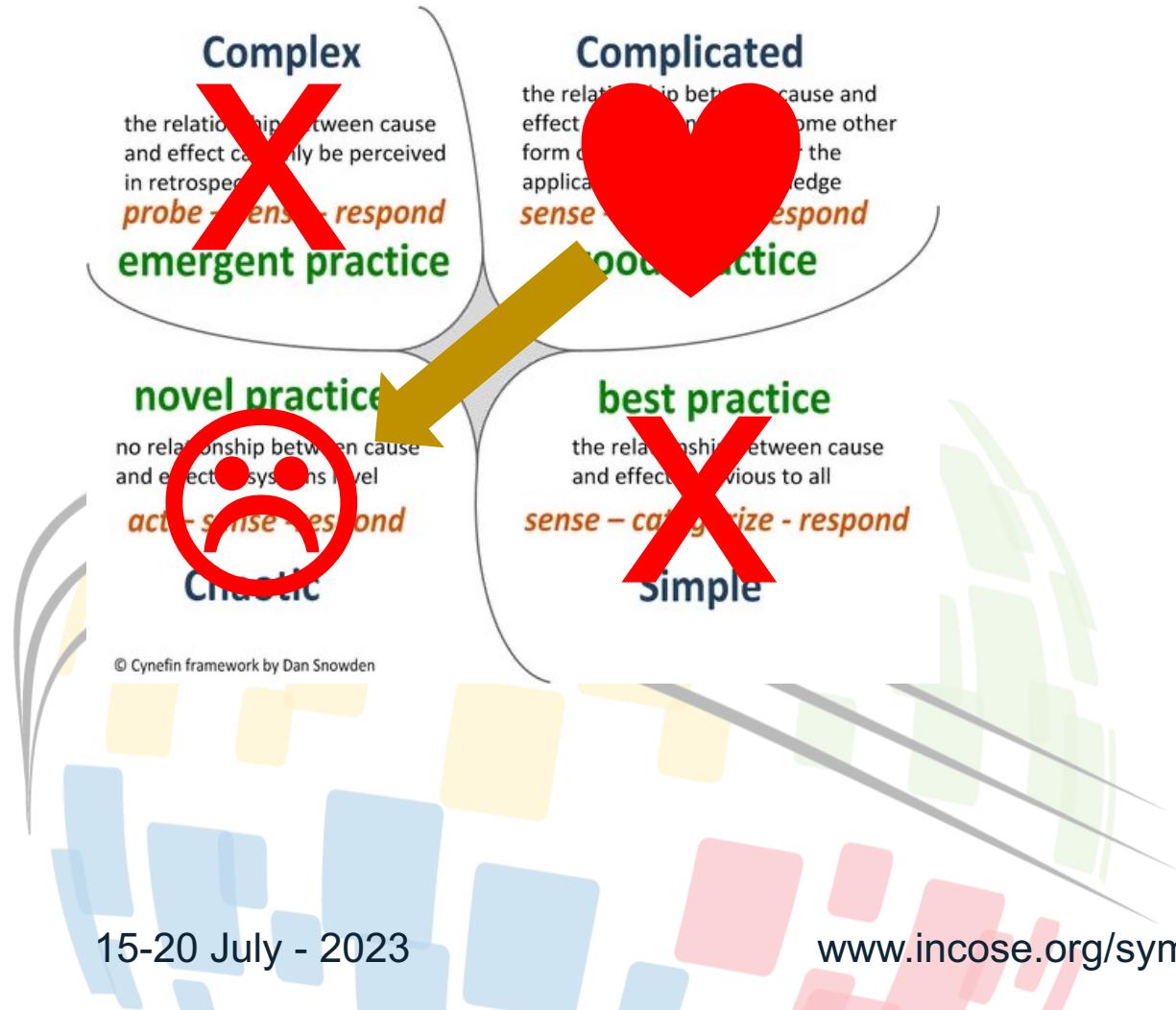


World Champion Garry Kasparov

I reached the formulation that a weak human player plus machine plus a better process is superior, not only to a very powerful machine, but most remarkably, to a strong human player plus machine plus an inferior process.

– Garry Kasparov

KICS - Keep it Complicated, Stupid*



What is the System?

Exploiting the digital power of computation, AI/ML, visualization and communication to take better, faster actions



- Simulated world

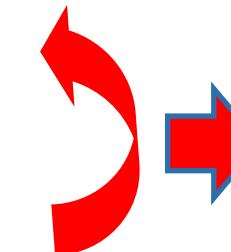


- Experimental data

- Observed world

Dynamic System Validation

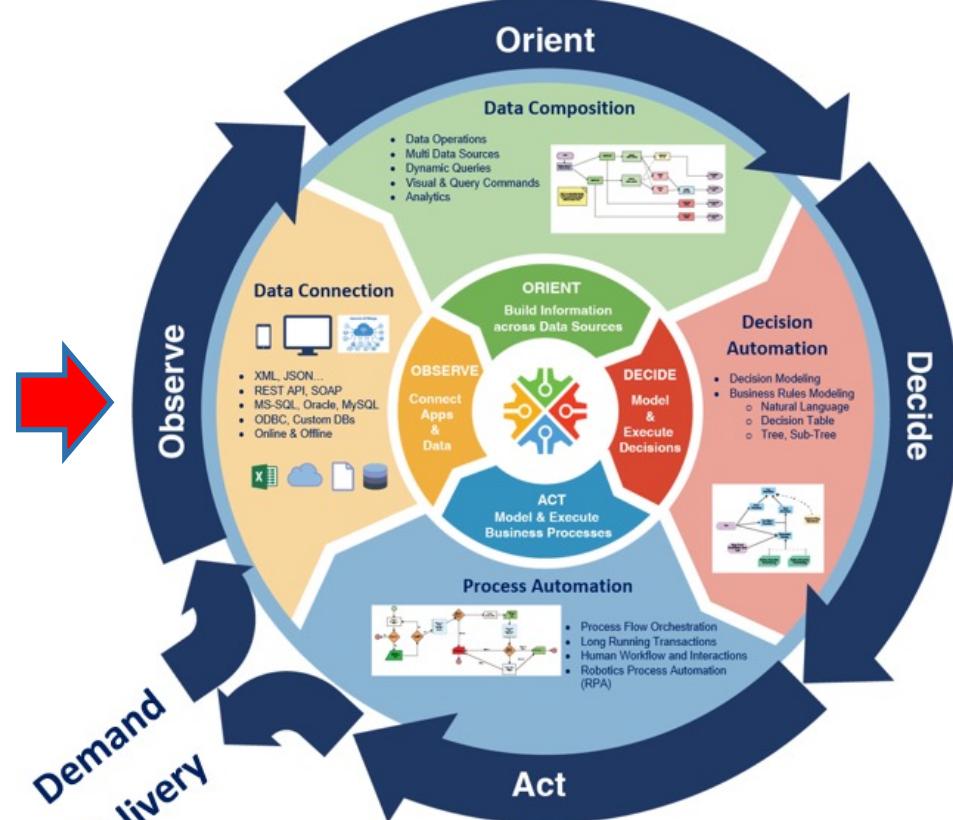
Physical Virtual



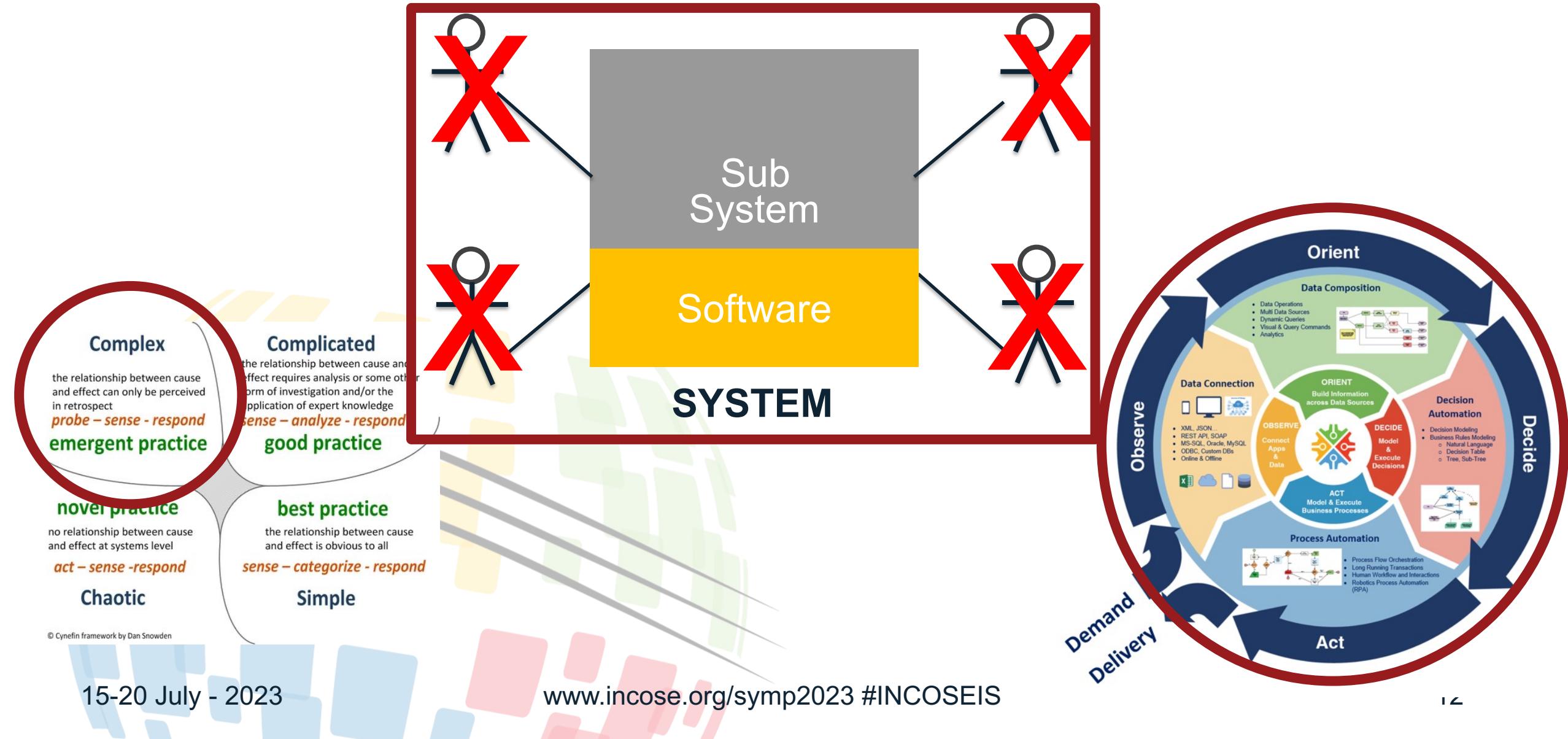
Demand Delivery

Observe

Act



Time for System Engineering to Step Up

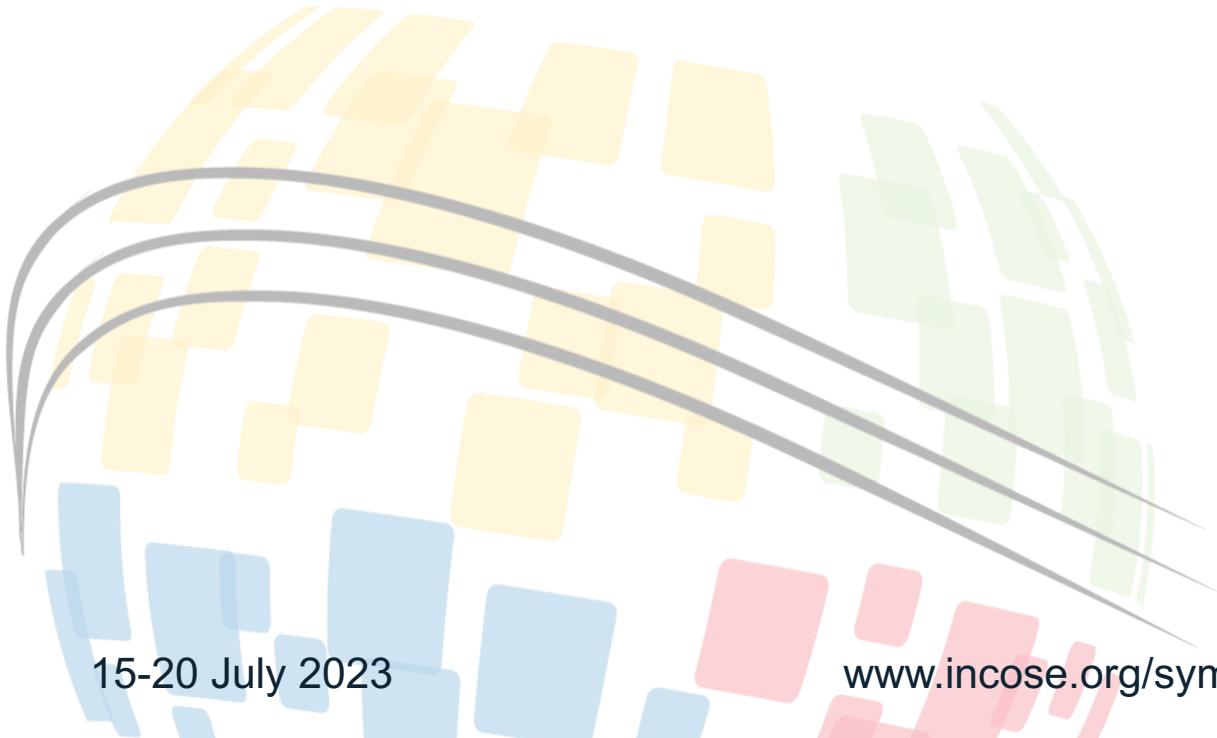




Professor Duncan Kemp, CEng, FIET, INCOSE Fellow UK Ministry of Defence



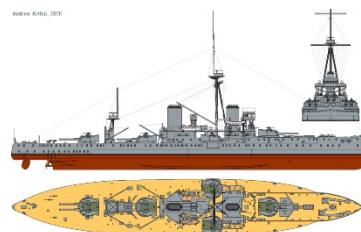
“Those that fail to learn from history are doomed to repeat it.”



History of Systems Engineering



2600 BC



1900s



1930s



1960s

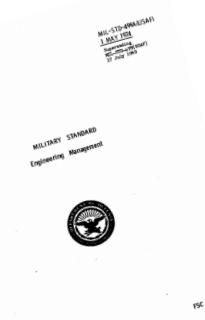


2010s

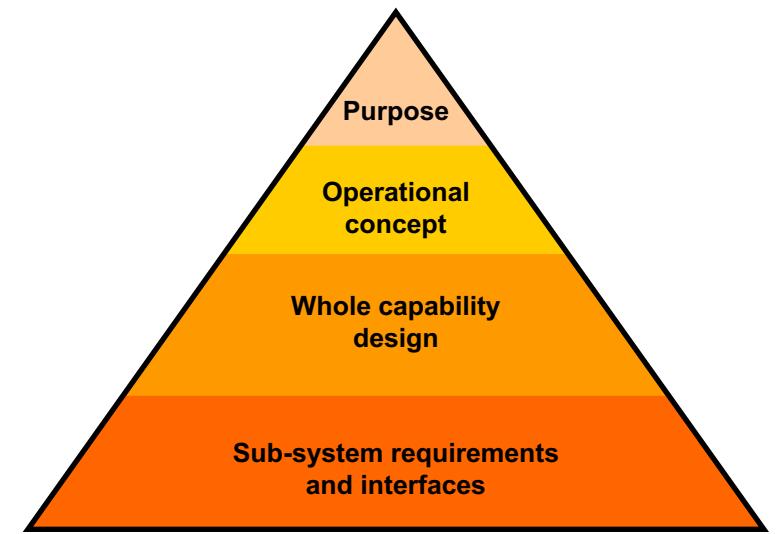
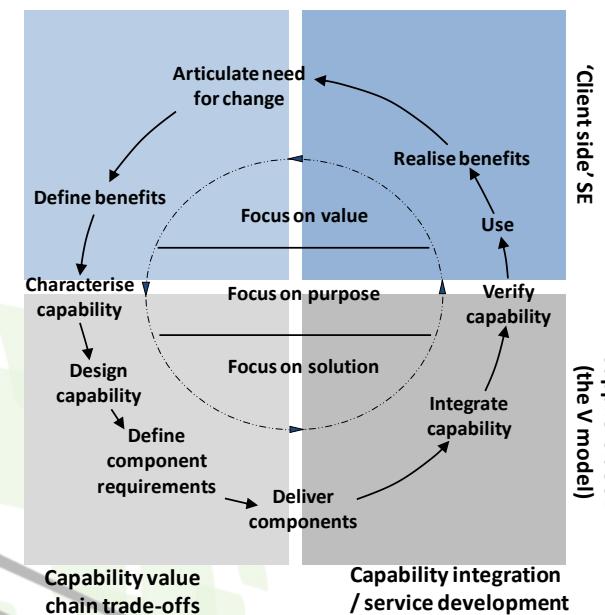
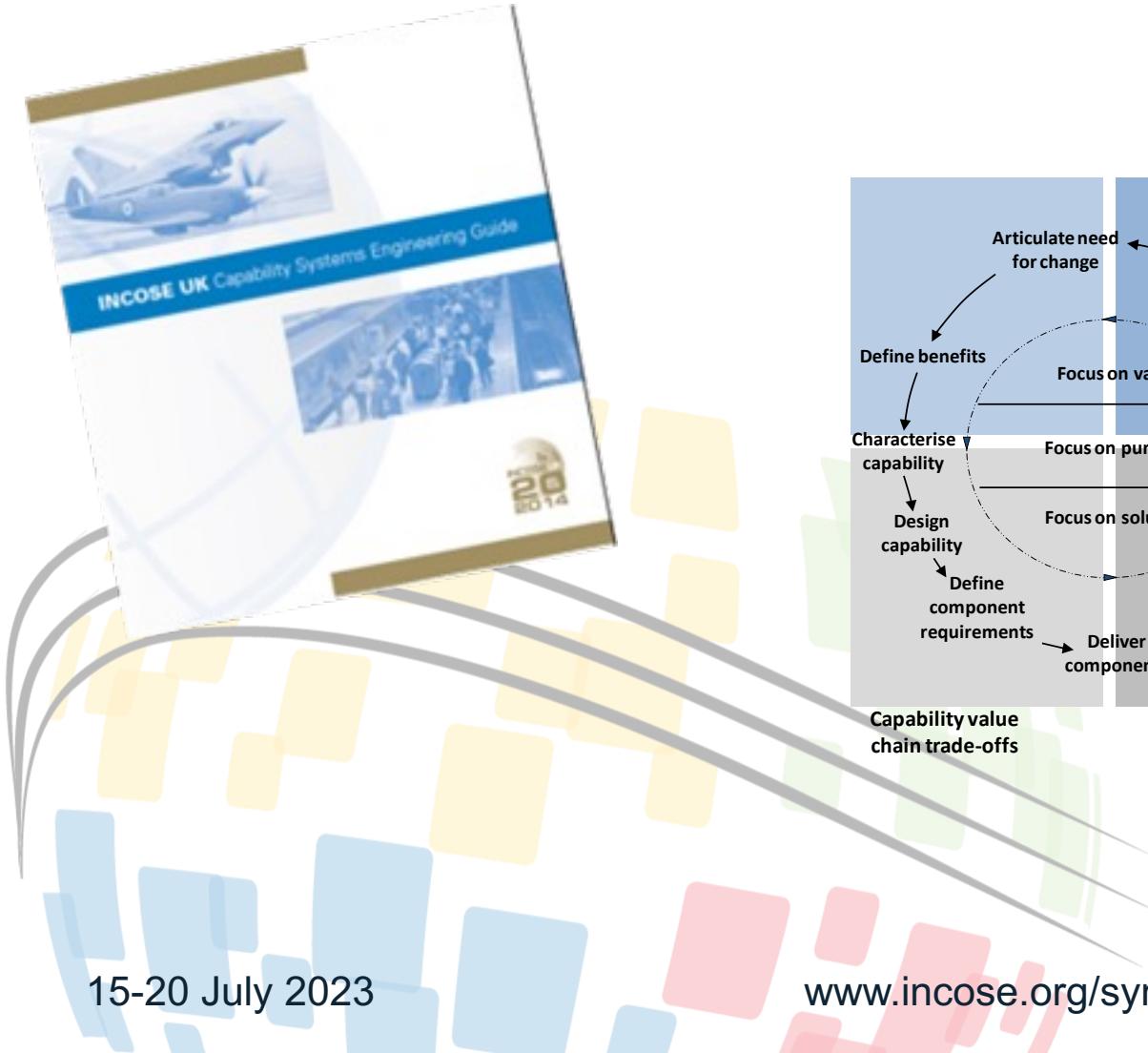
1940s



1970s



Capability Systems Engineering





**Dr. Erika Palmer
INCOSE Deputy Technical Director
Cornell University**



REVIEW ARTICLE

A systematic literature review of sociotechnical systems in systems engineering

Dana Polojärvi ✉, Erika Palmer, Charlotte Dunford

Using Agent-Based Models for Prediction in Complex and Wicked Systems [PDF](#)

J. Gareth Polhill^a, Matthew Hare^a, Tom Bauermann^b, David Anzola^c, Erika Palmer^d, Doug Salt^a and Patrycja Antosz^e



REGULAR PAPER

A methodology for modeling sociotechnical systems to facilitate exploratory policy analysis

Michael J. Pennock ✉, Douglas A. Bodner



Systems Engineering Applied to Evaluate Social Systems

Analyzing systemic challenges to the Norwegian welfare state



JASSS is an interdisciplinary journal for the exploration and understanding of social processes by means of computer simulation



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