



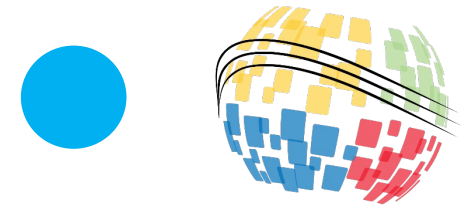
32nd Annual **INCOSY**
international symposium

hybrid event

Detroit, MI, USA
June 25 - 30, 2022

Death Rays, databases, and double diamonds

Presenters



- 18+ years of systems engineering experience
- Focus on safety critical and business critical systems
- Experience spans industries and concept, design, product launch, manufacturing, and system services
- Co-chair of the INCOSE System Safety Working Group
- Former member of the INCOSE BOD and chair of the Biomedical Working Group

Meaghan O'Neil

Director, Systems Consultant
System Design and Strategy Ltd
Bristol, United Kingdom
Meaghan@incose.net
www.systemdesignandstrategy.co.uk

System Design and Strategy Ltd.



- Developed and leads 60 person Internal SE Consultancy at DE&S
- Digital Engineering Implementation Leader
- Over 30 years experience of developing safe and effective systems in Defence, Information Services, and Rail
- Visiting Professor of Systems Thinking at Loughborough University
- Co-chair of the INCOSE System Safety Working Group, INCOSE Fellow, IET Fellow

Professor Duncan Kemp, CEng FIET, INCOSE Fellow

DE&S Fellow for Systems Engineering
Internal Technical Support Team Leader
Engineering Group
Abbey Wood South, BS34 8JH
Tel: +44 (0)7966 146 724

Defence Equipment and Support

Presentation overview

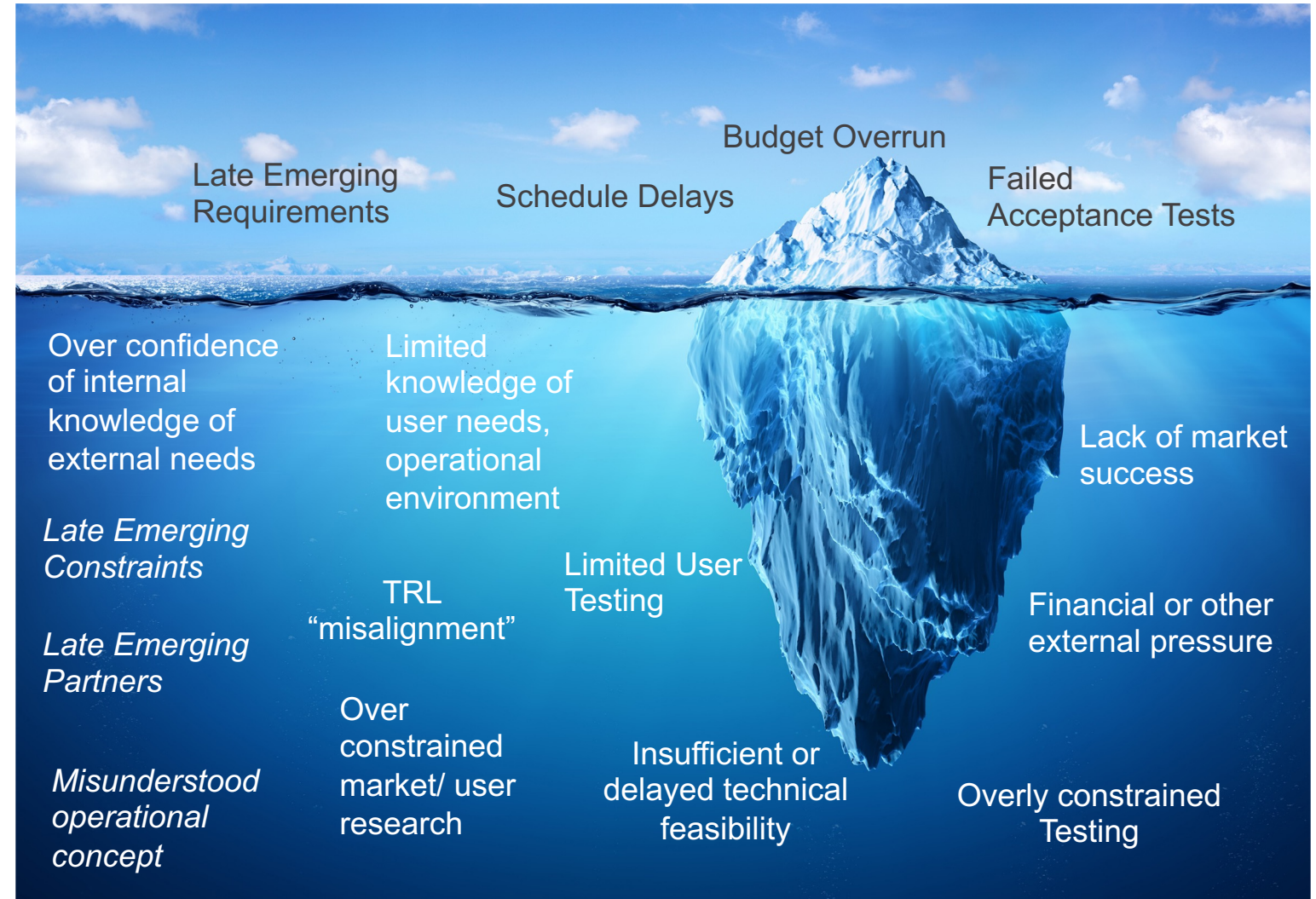
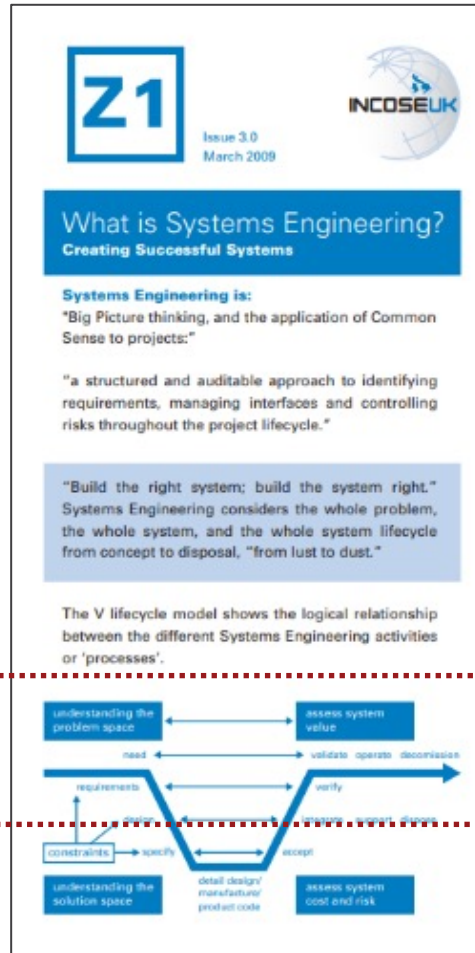
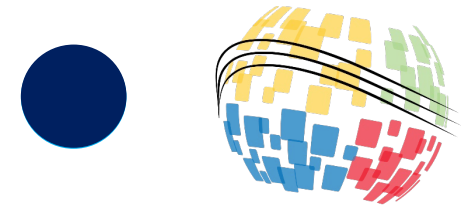
- Why we need to focus on the “real problem”
- Why this is hard in practice
- Practitioners experience and lessons learned



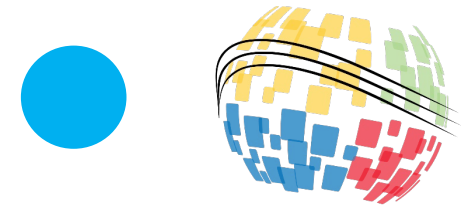
Understanding the right problems to solve



Example Signs and Symptoms ...



Functional chasms



Market Research

Need Exploration

Voice of the Customer

Operational Reality

*Product Specification
(Market Led)*



Technical Feasibility

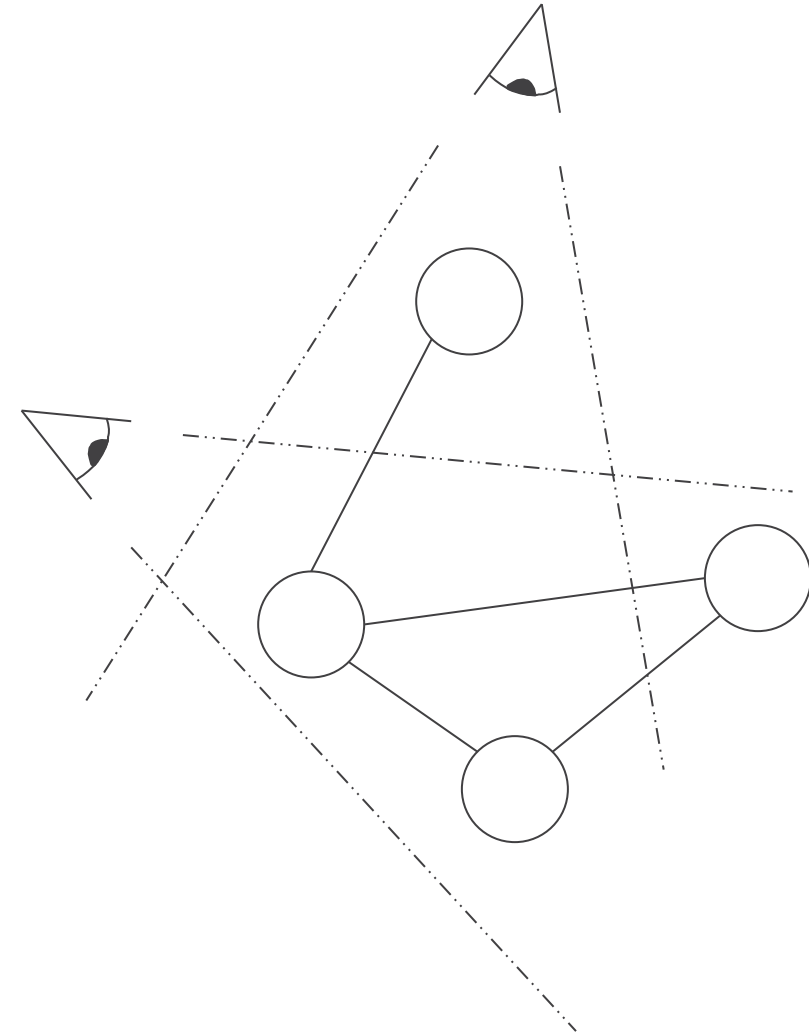
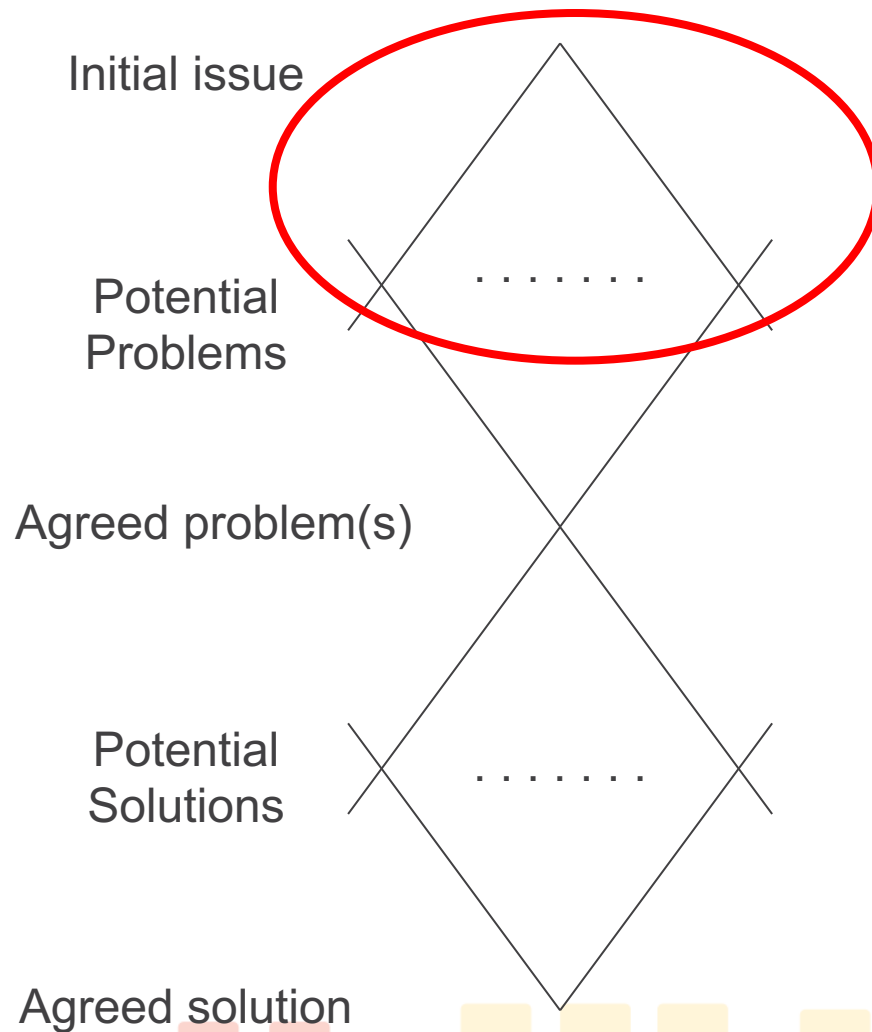
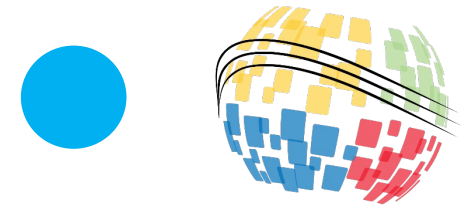
Technical Specification

Design Specification

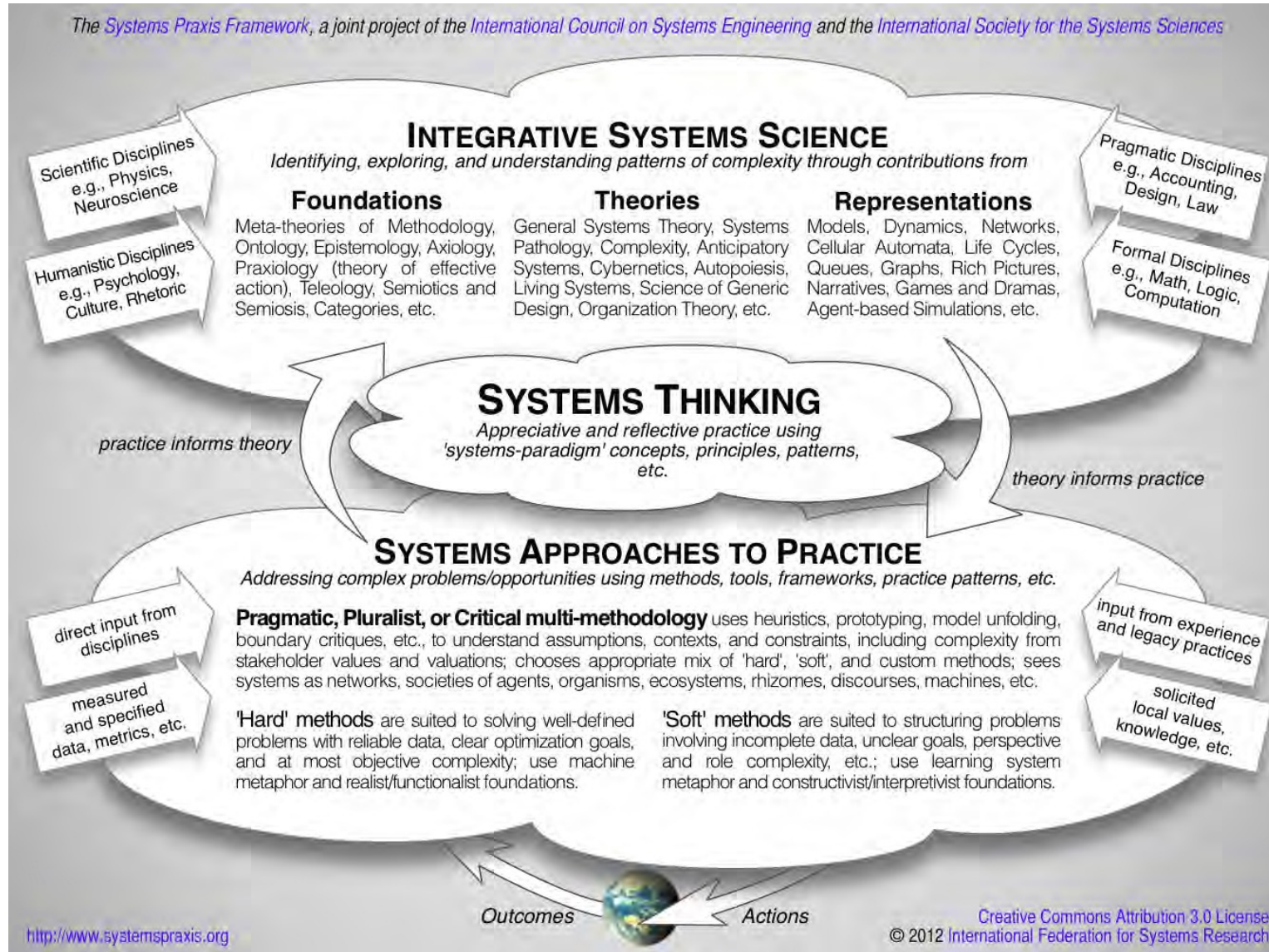
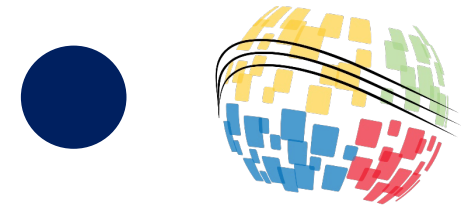
Manufacturing

In Service Support

Systems Thinking



So, what can we do?



Navigating in Practice...

Examine Alternatives

Purpose *Boundaries*
Perspectives

Explore Operational Concept

Normal *Maintenance*
Fall back

Develop Understanding

Context *Related Systems*
Operating Environment

Align Ends Ways Means

These Benefits...
Built to do this...
Using this design...

Observe / Test

With proposed users
With old equipment

2 Up, 2 Down

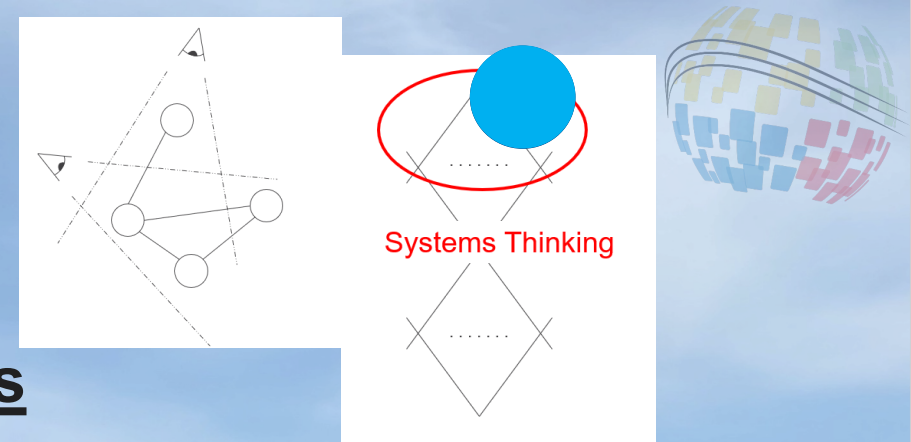
Consistency checks

“drive stake through”

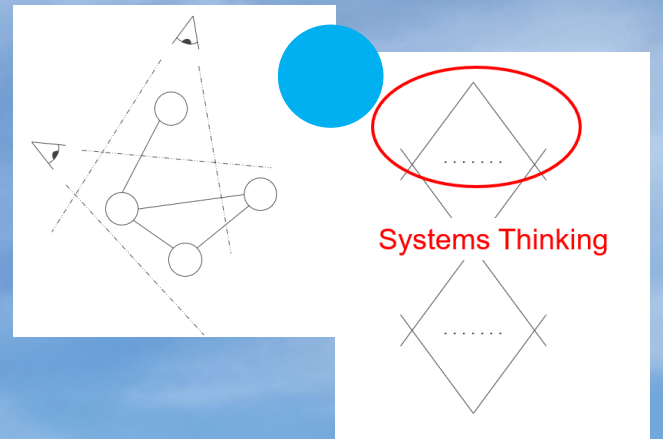
Deep User Conversations

Expert Consultations

Non-Expert Consultations



Obstacles to anticipate



This will cause unacceptable delays

Don't overcomplicate things

Significant time was already spent on this

Needs (and solution) has already been approved

Just get on with it

Approaches to Influencing

Tell a better story

*Using their
language, heroes,
and villains*

Provide Better Data

*From sources
they understand
and trust*

Work their network

*Using sources they trust..
(avoid relying on authority)*

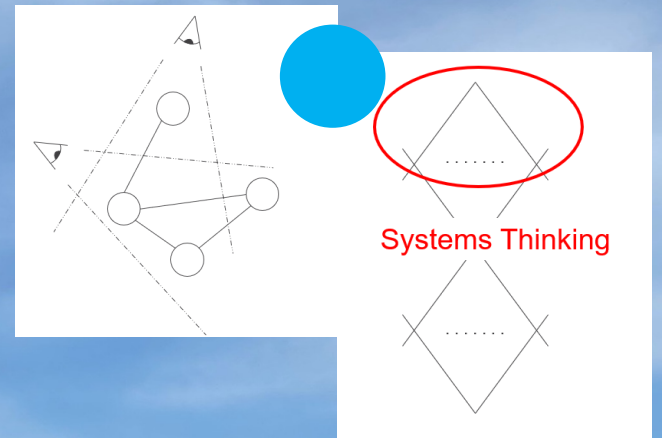
*This will cause
unacceptable delays*

*Needs (and solution) have
already been approved*

Just get on with it

*Significant time was
already spent on this*

*Don't overcomplicate
things*



Approaches to Influencing

Tell a better story

*Using their language,
heroes, and villains*

*Understand the
real story*

*Seek the
evidence*

Provide Better Data

*From sources they understand
and trust*

*The situation has
changed*

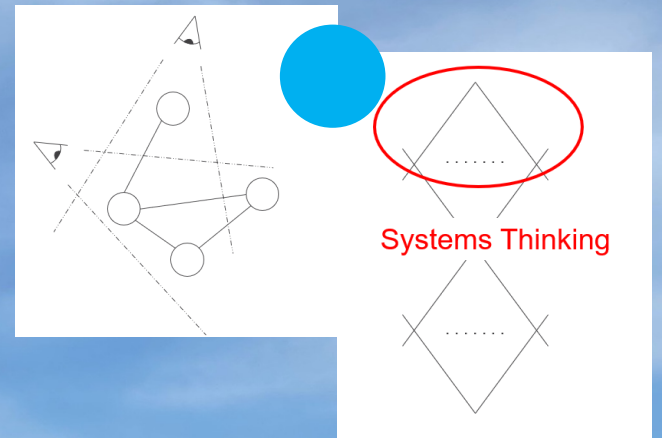
*Find company
historians*

Work their network

*Using sources they trust..
(avoid relying on authority)*

*This is
unbuildable*

*Truth to Power
for safety critical*



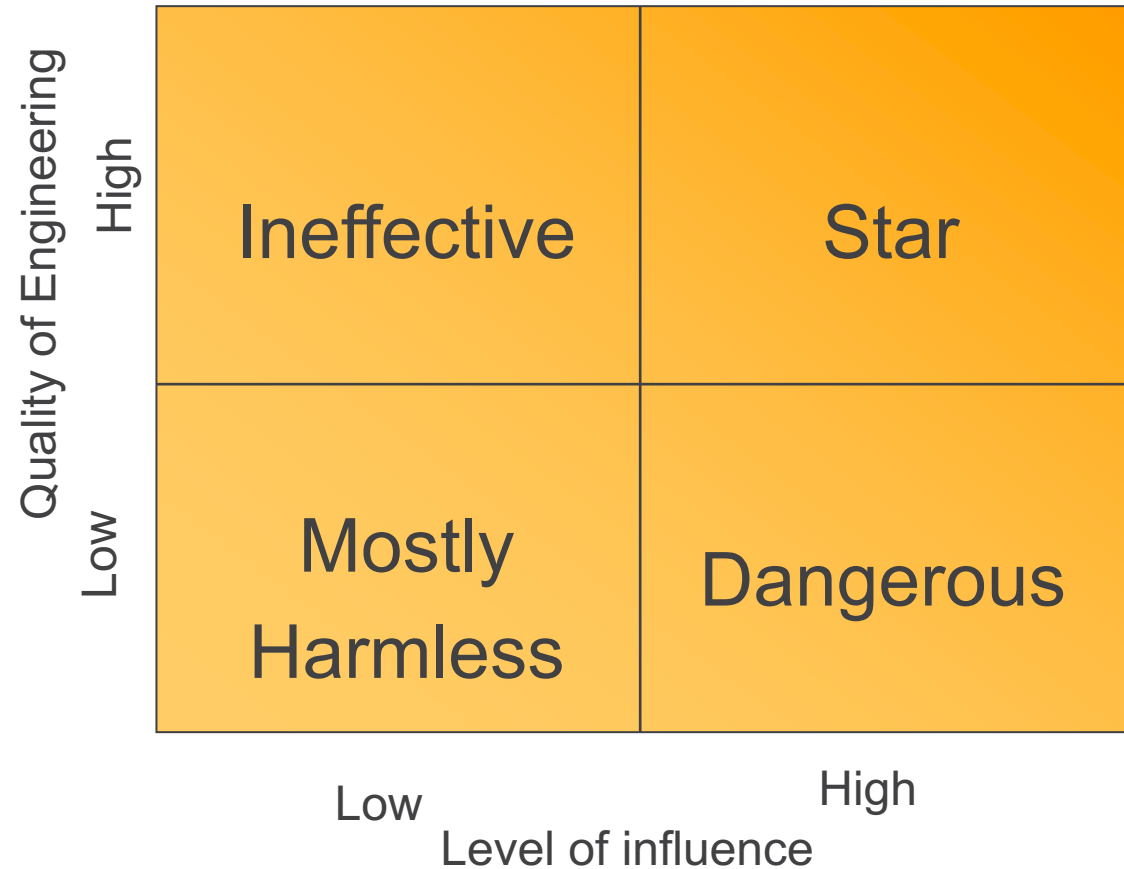
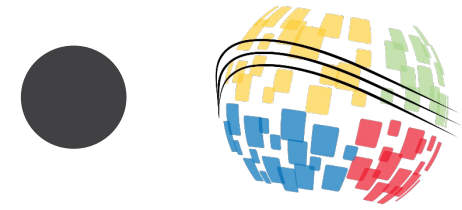
*Document
concerns (lose
the battle, win the
war)*

Serenity Prayer

Exit



Effective engineers



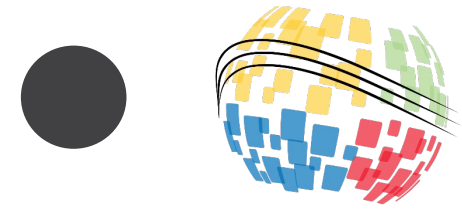
Technical Skills

Industry/Domain Knowledge

Soft Skills

Role experience

Easier in practice than theory ...



“Have we passed Swindon yet?”

“Wow – two hours on the motorway – I am exhausted”

“... why do I keep stalling the engine”

“Mummy is driving – that looks fun”

Unconscious Competence

Conscious Competence

Conscious Incompetence

Unconscious Incompetence

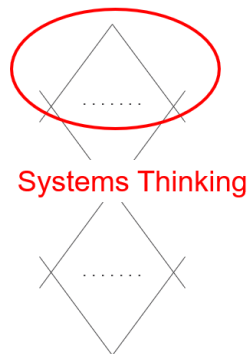
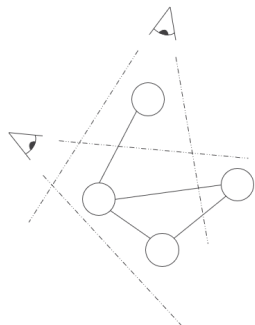
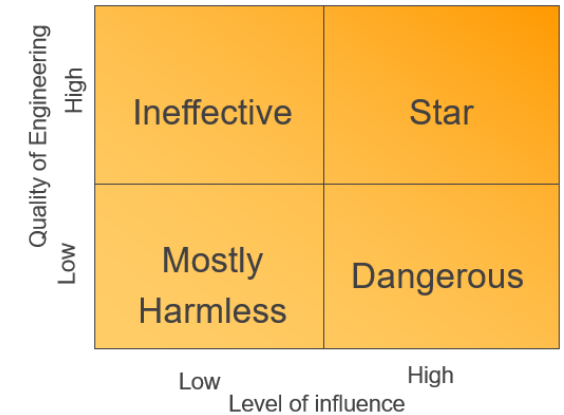
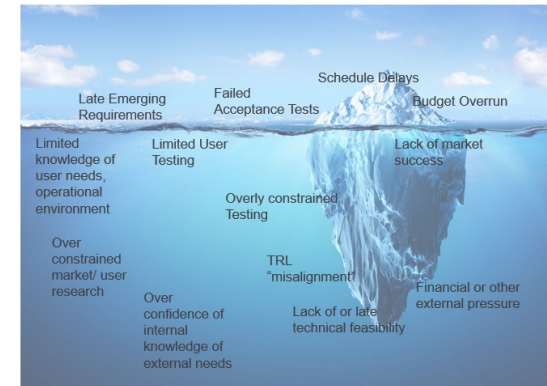
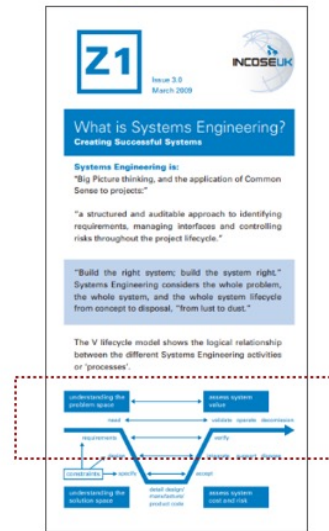
“We don’t need a ‘one size fits none’ solution here”

“Hang on, how is that going to work”

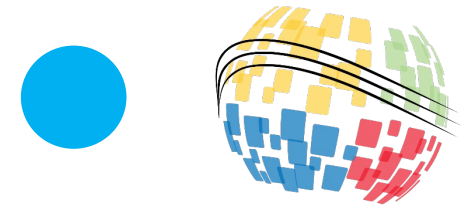
“ ... I should really have said this in the meeting”

“That’s just common sense – anyone can do it”

Summary



Questions for the Presenters?



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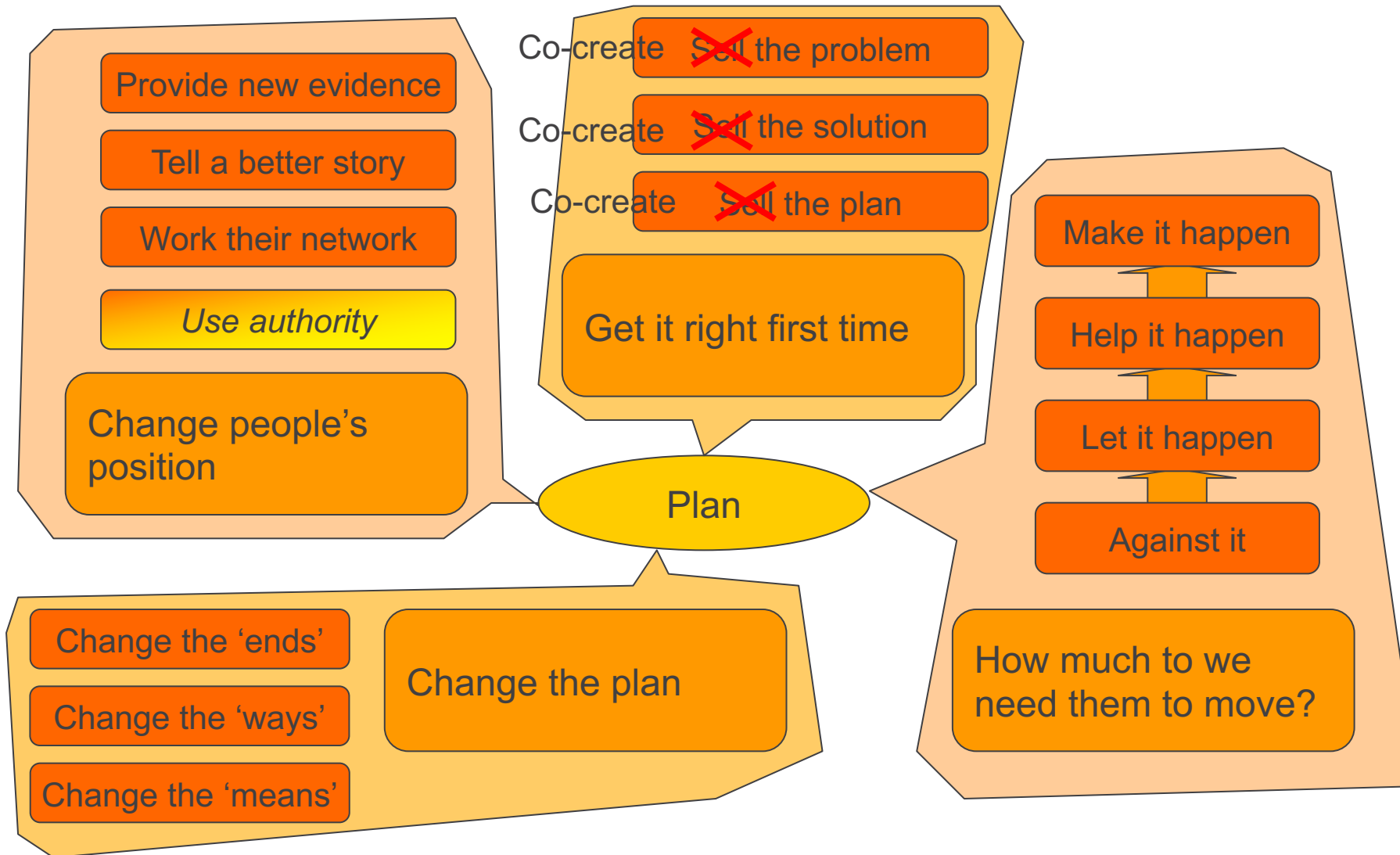
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www.incose.org/symp2022

Focussing on what matters to people



Decide the appropriate team structure: embedded project engineers, SE augmentation or SE product delivery. Get the right balance between in-house employees and external contractors

