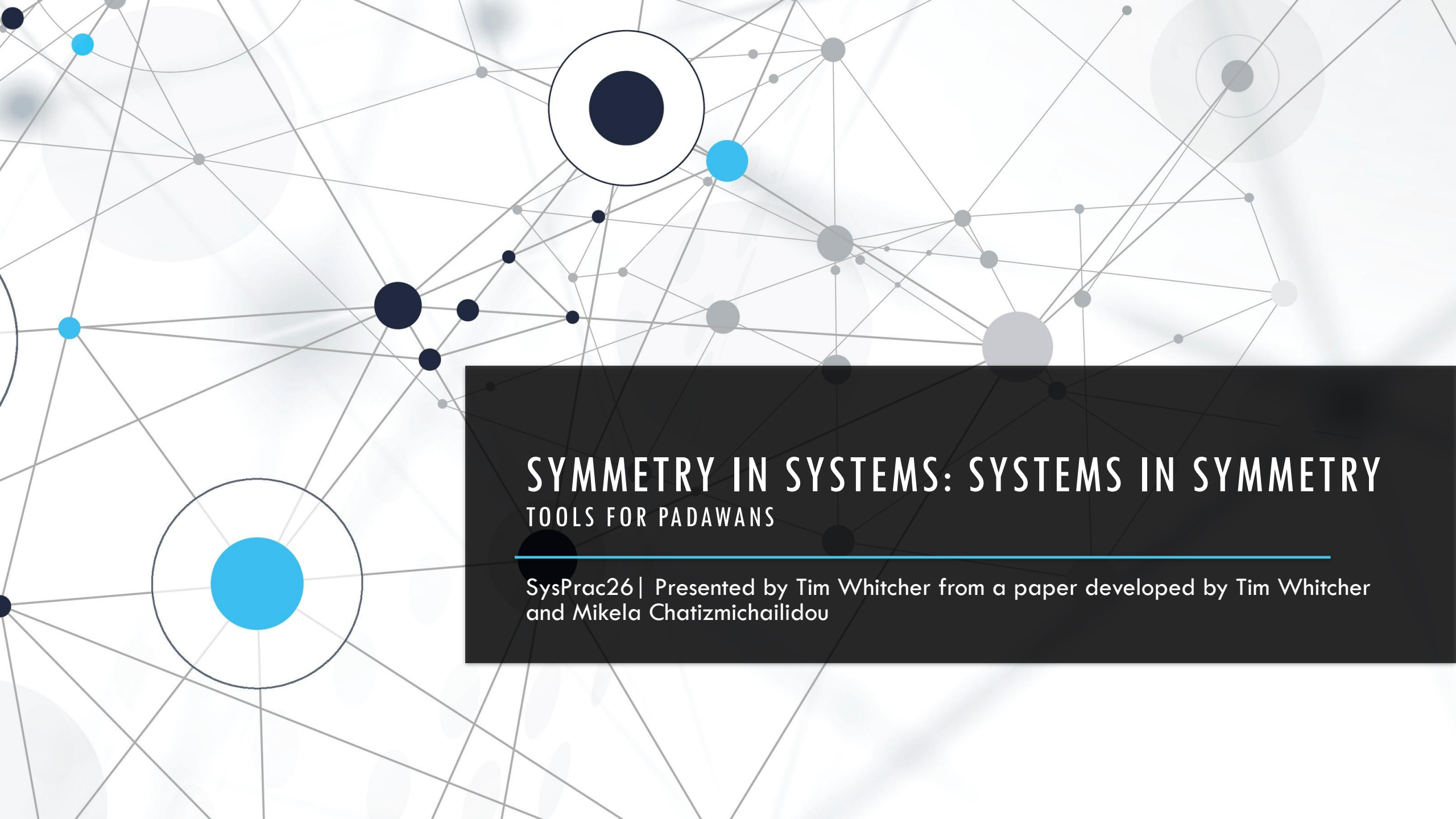


The background features a complex network diagram with numerous nodes of varying sizes (dark blue, light blue, and grey) connected by thin grey lines. Some nodes are highlighted with larger concentric circles. The overall aesthetic is technical and interconnected.

SYMMETRY IN SYSTEMS: SYSTEMS IN SYMMETRY

TOOLS FOR PADAWANS

SysPrac26 | Presented by Tim Whitcher from a paper developed by Tim Whitcher and Mikela Chatizmichailidou

ABOUT ME

I have spent my career solving problems and creating opportunities across the technical and organisational domains – both internal and external.

I like to explore innovation and build the teams that facilitate it, to date I have specialised in autonomous railways and complex multi-disciplinary systems but am equally at home applying myself to complex systems of all kinds.

My experiences include growing start-ups and SMEs, working for national and global organizations, and supporting stakeholders from shop-floor to boardroom level.

ROLE: SYSTEMS ENGINEER

Job Description: A Systems Engineer is the leader of a complex project – they provide the critical insights and objective assessments needed to manage complexity and develop an evolved solution. They work with all parties and stakeholders to engender alignment and bring together multi- and inter-disciplinary designs: every complex project in infrastructure, energy, defence, aerospace, automotive and digital systems utilised Systems Engineers to deliver assured outcomes. Systems Engineer's have a wide-ranging tool kit to help them and at its foundation is the NASA-pioneered systems engineering process. System Engineer's often act as the technical 'guiding mind' on a project –which is not a skill that comes naturally to everyone but one that can be learned with practice.



ROLE: SYSTEMS ENGINEER

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

George Box

SYSTEMS IN SYMMETRY

UNDERSTANDING THE OPERATING CONDITIONS

ID	Requirement	Rationale
T-001	The tool shall be context agnostic	A generic tool will have the most applicability
T-002	The tool shall accommodate both positive and negative relationships	To enable the user to apply the tool to any type of relationship
T-003	The tool shall be intuitive to understand and apply	The tool must be usable under pressure and with minimal cognitive demand
T-004	The tool shall be applicable with minimal preparation time	To enable the user to apply the tool whilst under pressure
T-005	The tool output shall be testable by the user	To enable the user to verify and validate the outputs

SYMMETRY IN SYSTEMS

UNDERSTANDING STABILITY

All interfaces have 2 core properties.

1: The can be defined in terms of 3 relationship pairs:

Pole 1	Pole 2
Risk	Reward
Supply	Demand
Freedom	Control

Table 2: Critical Dipolar Pairs

2: Relationships are reciprocal:

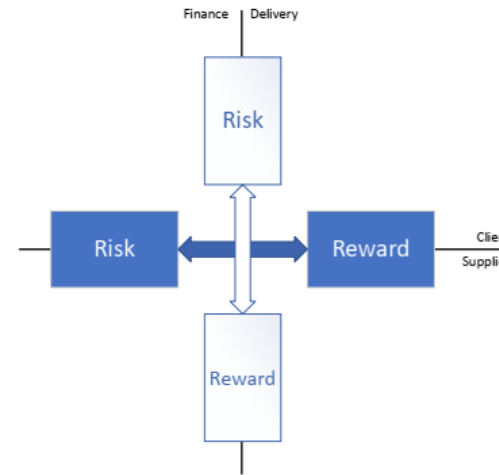


Figure 2: Risk vs Reward Lines of Symmetry 1

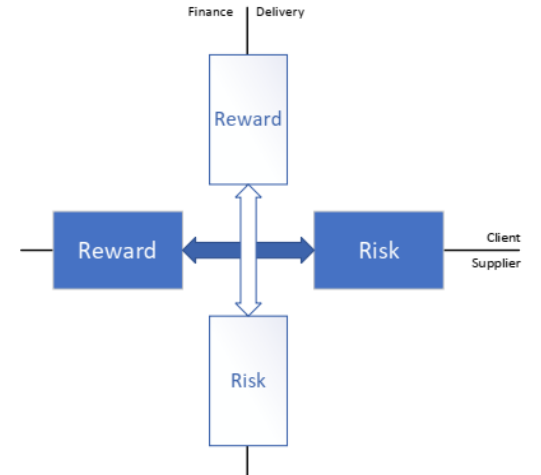


Figure 3: Risk vs Reward Lines of Symmetry 2

CRITICAL VALUE BALANCE THEORY

UNDERSTANDING SYSTEM STABILITY



Figure 2: Risk vs Reward Lines of Symmetry 1



Give	GiveBalance	Give
Pole_1	Dipolar Stability	Pole_2
Stability	Σ Stability	Stability

Figure 4: Dipolar Stability Grid



Calculating Give Values:

	Unbalanced	Balanced
GiveBalance	0	1

Table 3: GiveBalance Values

Calculating Stability Values:

	Volatility	Uncertainty	Ambiguity
Stability	0, 1	0, 1	0, 1

Table 4: Stability Values

Thus:

$$\Sigma \text{Stability} = \text{Volatility} + \text{Uncertainty} + \text{Ambiguity}$$

Σ Stability will therefore carry a value of 0, 1, 2 or 3.

Dipolar Stability is therefore:

$$\text{Dipolar Stability} = \frac{\text{GiveBalance}}{\Sigma \text{Stability}}$$

Yielding potential results of 0, 1, $\frac{1}{2}$ or $\frac{1}{3}$. Values 0, $\frac{1}{2}$ and $\frac{1}{3}$ represent an unstable dipole and are equivalent to a binary 0. A yield of 1 is the equivalent of a binary 1 and represents a stable system (strictly speaking ∞ is also possible through a 1/0 but since in real terms nothing is infinitely stable we would treat this as a 1). When applied to each Dipole within a system, this allows the system engineer to assess the stability of each interface and build a composite picture of the whole system.

	Volatility	Uncertainty	Ambiguity
Stability	0	0	0
Rationale	The demand is consistent and unlikely to change	Changes will be slow and marginal	Low risk of misunderstanding in the relationship

Therefore: $\Sigma \text{Stability} = 0 + 0 + 0 = 0$

Dipolar Stability is therefore:

$$\text{Dipolar Stability} = \frac{1}{0} = \infty \equiv 1$$

VISUALIZING COMPLEXITY

“You want to know how to paint a perfect painting? It’s easy. Make yourself perfect and then just paint naturally”. *R.M.Pirsig, Zen and the Art of motorcycle Maintenance*

THANK YOU FOR COMING!

I will share the paper, happy to talk about systems, symmetry or both(!) and always up to talk about how we create quick tools for the practitioner...

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