



25th anniversary
annual INCOSE
international symposium
Seattle, WA
July 13 - 16, 2015



A Set of Heuristics to Support Early Identification of Conflicting Requirements

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Presented by: Dr. Rob Cloutier



Apologies

Unfortunately I have not been able to be with you today...

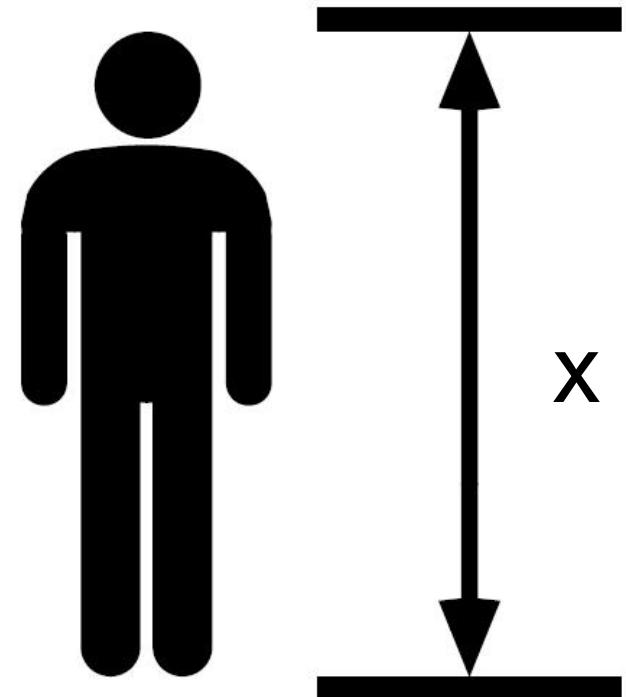
...but I am joining Virginia Tech in August as a junior faculty after 10+ years in the space industry...

...and have not been able to secure funding.

I hope to meet you in next IW and IS!

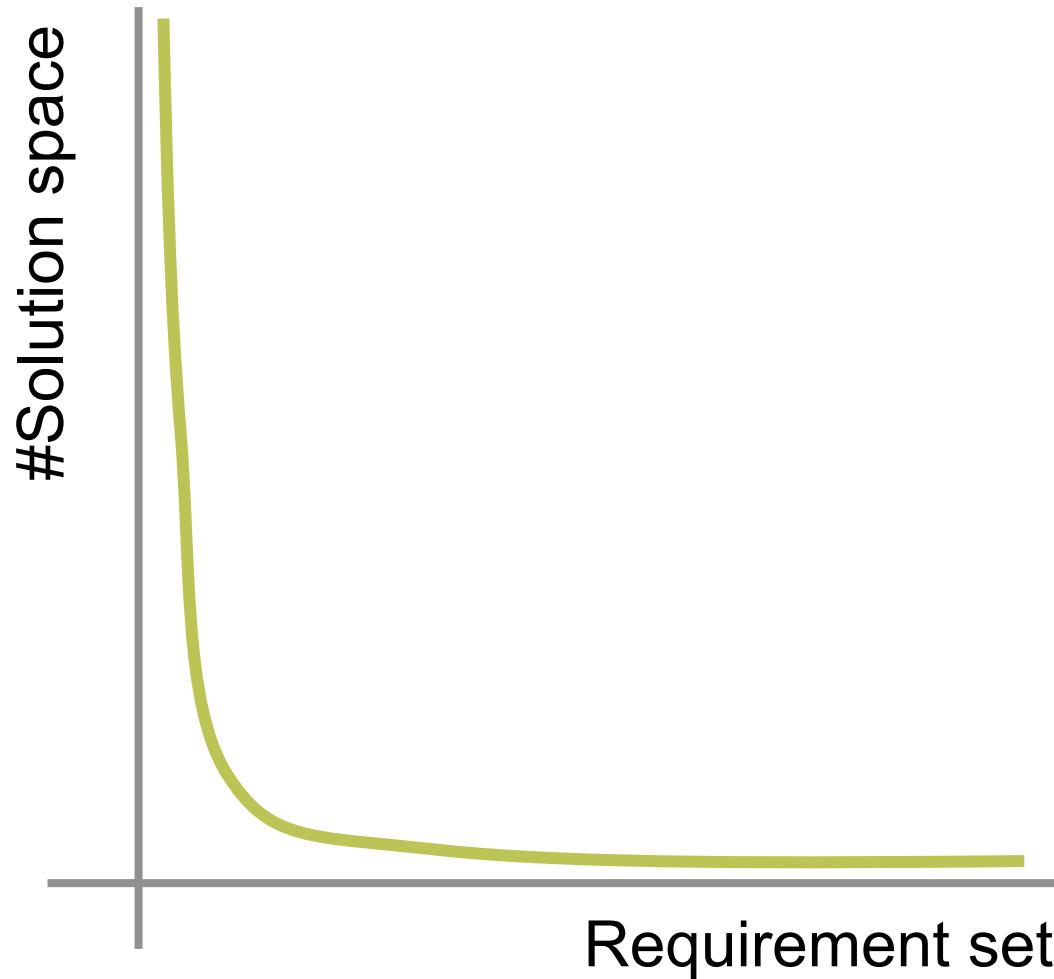
Defining a problem

The audience shall
congratulate
the presenter.

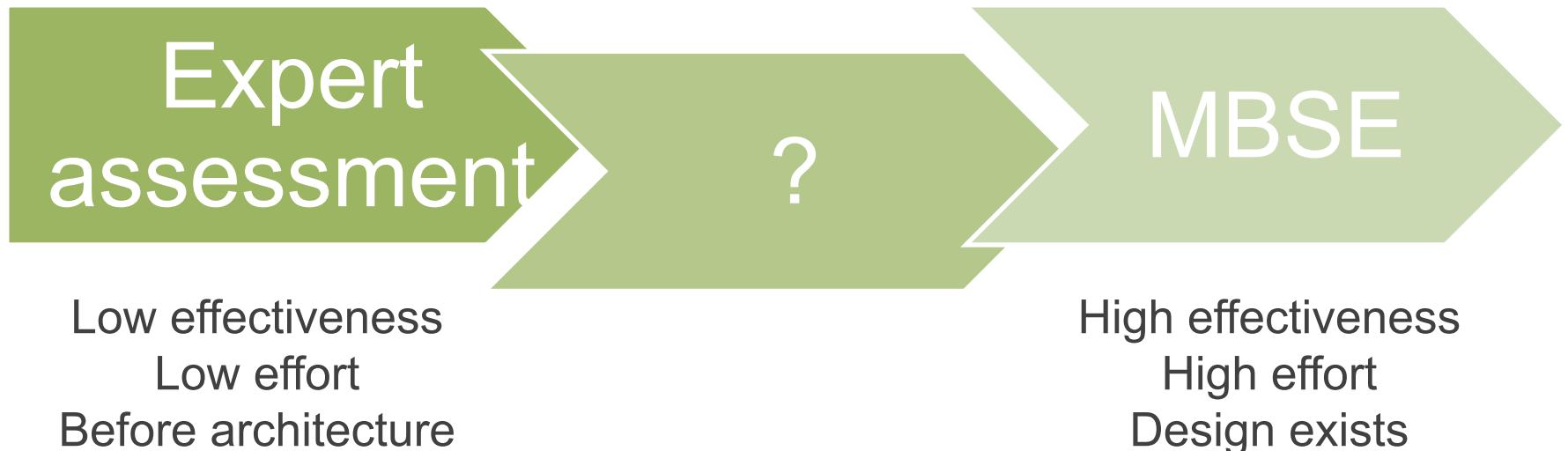


Output = 2 x Input A + Input B

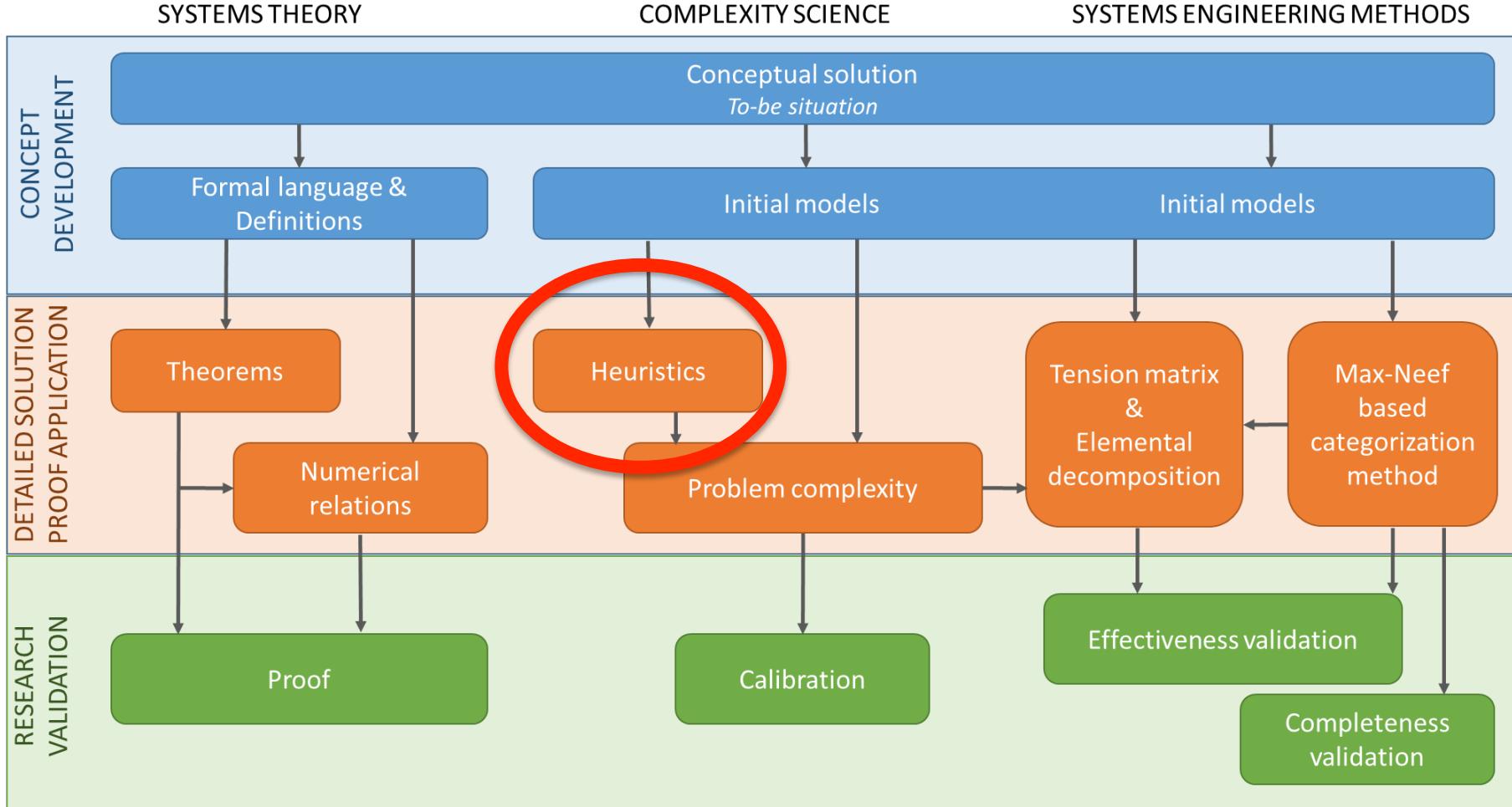
Reqs or objectives conflict



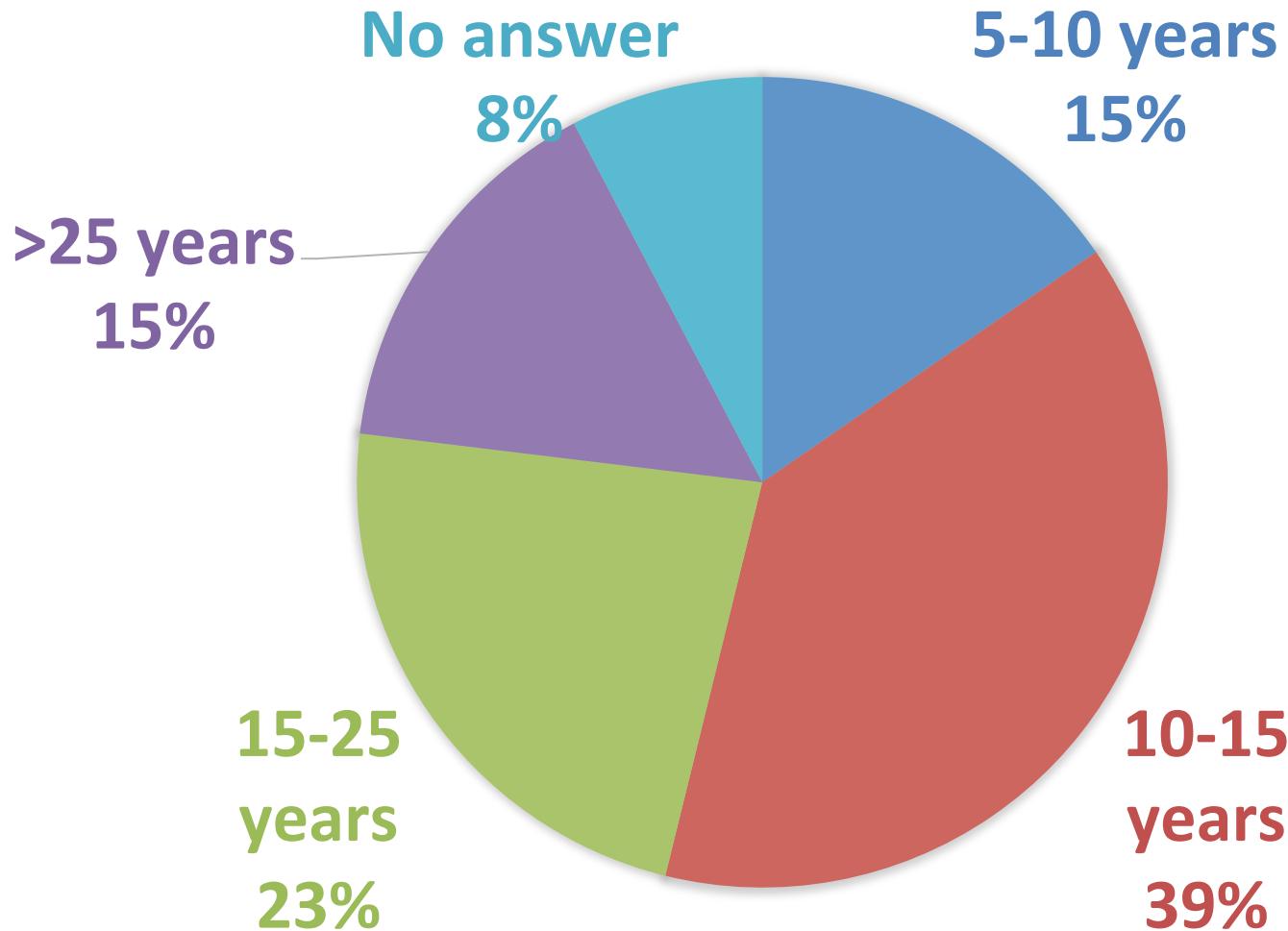
How to identify them?



A solution



Who



13 experts... Until convergence criteria achieved

How

Questionnaire:

- Positive and negative range
- Narrative discussion
- 0% to 100% agreement
- After pilot tests to ensure reliability
- Based on requirement partition

Conflict type	Functional reqs	Performance reqs	Resource reqs	Interaction reqs
Functional reqs	C1	C2	C3	C4
Performance reqs		C5	C6	C7
Resource reqs			C8	C9
Interaction reqs				C10

Results: program failure

Conflict type	FUNCTIONAL REQ	PERFORMANCE REQ	RESOURCE REQ	INTERACTION REQ
FUNCTIONAL REQ	1.00	0.53	0.39	0.53
PERFORMANCE REQ		0.75	0.65	1.00
RESOURCE REQ			0.82	0.43
INTERACTION REQ				1.00

Results: program success

LACK of conflict type	FUNCTIONAL REQ	PERFORMANCE REQ	RESOURCE REQ	INTERACTION REQ
FUNCTIONAL REQ	0.82			0.92
PERFORMANCE REQ		0.83		1.00
RESOURCE REQ			0.35	
INTERACTION REQ				0.35

Heuristics

A conflict may exist when two or more requirements oblige the system to...

- Operate in two or more phases of matter.
- Compete for the same resource.
- Satisfy opposing directions in laws of physics.
- Satisfy logical contradictions.
- Satisfy opposing directions in laws of society.

A few examples

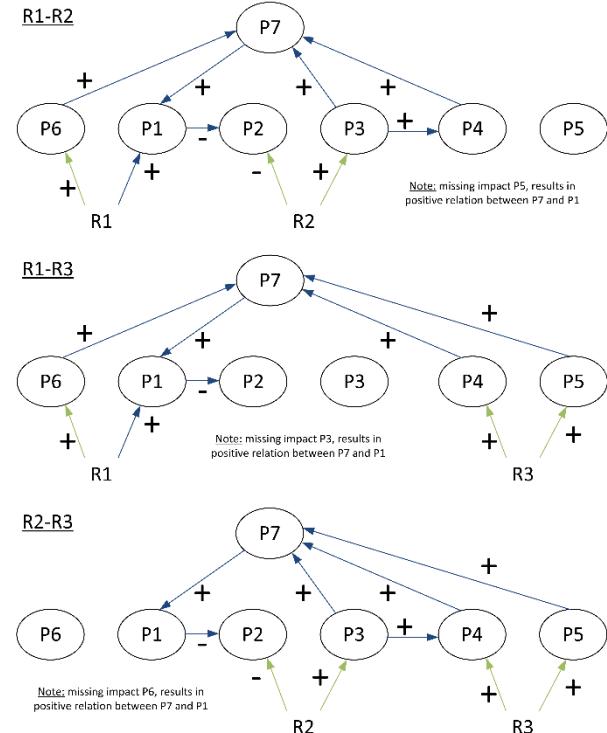


All images have been taken from Wikipedia The Free Encyclopedia.

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Seeding a method

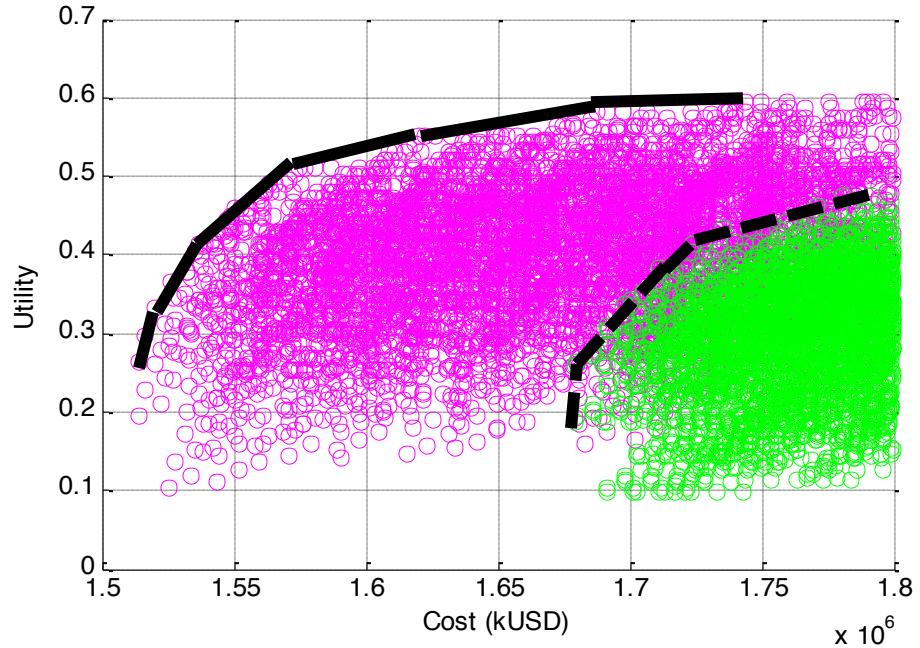
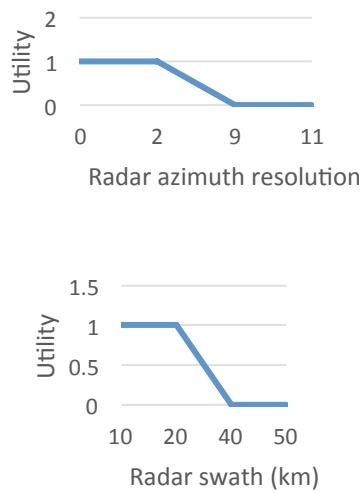
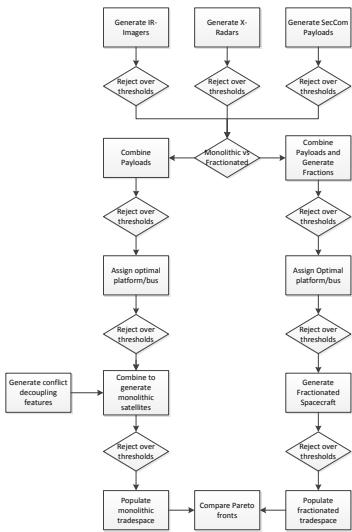
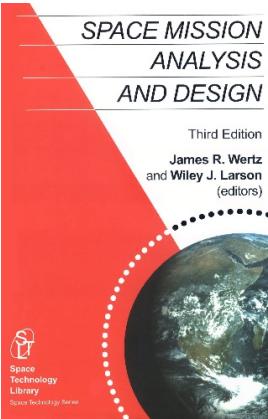
Reqs.		Resources			Phases of matter				Elemental decomposition									
									Laws of physics			Laws of society			Logical			
		r7	r8	r9	S	L	G	V	T	P	v	L1	L2	L3				
F	r1	X														Methods in chapter 2		
	r2		X									↑						
	r3			X														
P	r4									↓								
	r5	X										↑		↓	↑			
	r6				X							↑						
R	r7																	
	r8											↓						
	r9																	
I	r10				X													
	r11					X						↓						
	r12					X												



Objective assessment of independent requirements!

From A. Salado and R. Nilchiani "The Tension Matrix and The Concept of Elemental Decomposition: Improving Identification of Conflicting Requirements," IEEE Systems Journal, 2015.

Method effectiveness





Finale

In order to be fair with the presenter, please feel encouraged to send your questions to:

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Or

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