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sit vis vobiscum

## **Systems Methodology**

What every *Systems Engineer* should know?

**S**ystems Engineering was BIG during the Cold War. I mean BIG. ‘Air Defense of the UK’ BIG. Man on the Moon BIG. Star Wars BIG. In its contemporary form, it was developed by UK scientists (sic), trying to create a credible defense against the ever-changing Soviet Threat, starting back in the late 1950s. It was a comprehensive way—a *Total Weapon System* way—of finding innovative solutions to counter some existentially dangerous threat, about which very little was known.

And, because that threat was continually evolving, Systems Engineering evolved too. Or, more precisely, the *Systems Methodology*<sup>1</sup> evolved, to be able to cope with the unpredictable, the unexpected. Until, by trial & error/natural selection, it became really rather splendid! At creating innovative solutions to *seriously challenging problems*...

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<sup>1</sup> “A Methodology for Systems Engineering”, 1962, by Arthur D Hall III

We have many *seriously challenging problems* today. Over population. World migrations on a global scale. Potable water. Global warming. Catastrophic Species Extinction. Our Education Systems. Cultural wars. Pollution. A resurgent Cold War. Political Ideologies. Religious Extremism. But we're not employing the Systems Methodology to address any of our major problems. Or, are we?

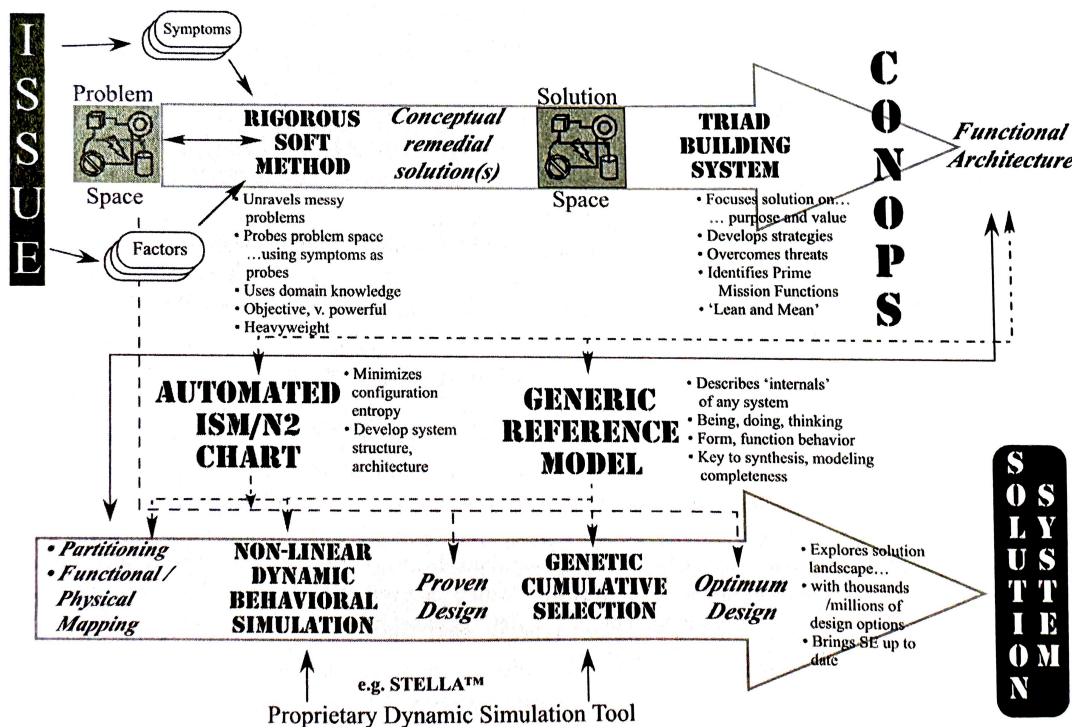
**S**ystems Methodology? Applied Systems Science. How to go about Systems Engineering... OR, a “*system of methods, techniques and tools.*” To be used by smart people—*applied systems methodologists*—of many different disciplines. Including—as Arthur D Hall III put it (Ref A) :—

- systems engineers,
- operations researchers,
- management scientists,
- systems analysts,
- policy researchers,
- value engineers,
- ecologists, and
- cyberneticians.

...*And they were all called systems engineers.* Why? Because, coming together as a team, they *engineered system solutions* to complex problems and issues. And, indeed, the phenomenal capability of the Systems Methodology is very largely down, not to the tools and methods, so much as to the combined skills of these varied “systems engineers.” Together, their diverse disciplines formed *Systems Science Teams*. Using methods, techniques and tools to combine their

different understanding. And, after all, systems engineering is “applied systems science!” Isn’t it?

**Methods, Tools and their Points of Action within the progress of the Systems Methodology. Ref. B.**



Follow the arrows: top, left to right, then bottom left to right. At each stage, the output from one tool or method provides the input to the next tool, or method.

Note: the Systems Methodology is *holistic synthesis: functional before physical*. (c.f. “Form follows Function:” Louis Sullivan. (1856-1924)

So, in principle, we have our mainstay, the Systems Methodology, with which to address today’s complex, multi-faceted issues.

Only, we haven’t—quite. The World has moved on since the end of the Cold War in 1989, or whenever. But nobody appears have been evolving the Systems Methodology to match. (Although, parts of the overall Methodology, such as

the Systems Approach, are evidently in use, in many disciplines—just, not the overt whole, connected up thing...)

Indeed, since the end of the Cold War, there seems to have been a determined effort to dismiss Systems Engineering, and the Systems Methodology along with it. Predictably, by conventional engineers, who continually and repeatedly, mistake the term “engineering” in *systems engineering* as giving them proprietary right to destroy, as it does not meet with their approval. Whereas, as we have seen, “*engineer*” can suggest “*a skillful contriver or originator of something...*”—in this case, of *systems*, as solutions to complex, often intractable, problems.)

**A**rthur D Hall III, the *acknowledged doyen<sup>2</sup> of US Systems Engineering*—yet ‘ignored’ by INCOSE—wrote a seminal book in 1989, right at the end of the Cold War: *MetaSystems Methodology: A New Synthesis and Unification*. (Reference A). In the Preface, he wrote:

*“What is envisaged is a new synthesis, a unified, efficient systems methodology (SM): a multi-phase, multi-level, multi-paradigmatic creative, problem-solving process for use by individuals, by small groups, by large multi-disciplinary teams, or by teams of teams. It satisfies human needs in seeking value truths by matching the properties of wanted*

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<sup>2</sup> See Wikipedia for Arthur D Hall III. He was a founder of the IEEE, and prophetically—wrote: “Who is afraid if Systems Methodology” in IEEE Systems Man and Cybernetics Society Newsletter, 1975.

*systems, and their parts, to perform harmoniously with their full environments, over their entire life cycles.*

*“...there are counter forces, too. The continual proliferation of specialities, the determined effort of academic departments to protect their turf, and the divisive tactics of special interests. There is no one person who can push evolution in one direction or the other—it is too big. Perhaps it (this book) can help to illuminate a path to a better world: at least this may enhance an atmosphere for change towards integration. And that, my friends, explains why I have written this book, not as a finished entity, but as a discussion about SM, i.e., as meta<sup>3</sup>-systems methodology.”*

**I** was inspired by Arthur’s work to write: *Systems Engineering: A 21<sup>st</sup> Century Systems Methodology* nearly 30 years later in 2007.

Not, I’m afraid, as the splendid meta-systems methodology he envisaged. But simply to bring the Systems Methodology of the late ’80s up to date (2007). Still, naïvely unaware that INCOSE leadership was not, and never had been from its inception, concerned with ‘systems engineering,’ *per se*.

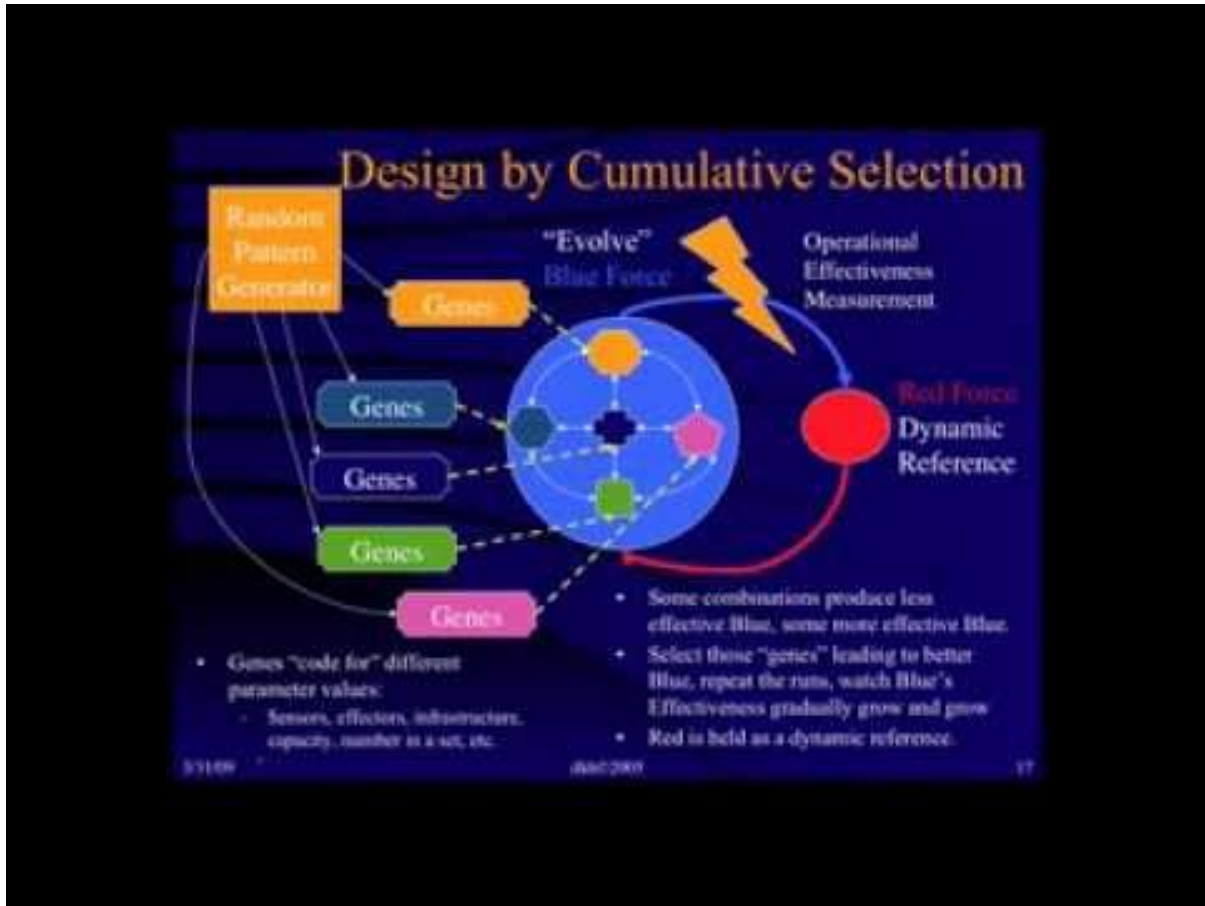
Not unexpectedly—a *prophet hath no honor in his own land*—it fell on deaf ears: it was not Engineering of Products.

Enjoy the video! Glimpse what you have been missing... Oh! And the Systems Methodology you are about to see is, itself, some 17 years old...so itself in need of resuscitation???

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<sup>3</sup> ‘Meta-’=“overarching.”

# Systems Methodology



The video was created in 2008 for systems students. It presents part of the book at Reference B—also intended for students of all ages, capabilities and persuasions. With the passage of time, the references to my web site in the video no longer work.

*Den Del*

*Feb '24*

## References:

- A. Hall III, Arthur D., 1989, *MetaSystems Methodology*, Pergamon Press, IFSR International Series on Systems Science and Engineering, ISBN 0-08-036956-1
- B. Hitchins, D. K., 2007, *Systems Engineering: A 21<sup>st</sup> Century Systems Methodology*, Wiley Series in Systems Engineering and Management, ISBN 978-0470-05856-5