International Council on Systems Engineering
A better world through a systems approach

Review of Systems Practice Frameworks

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The Rise of Uncertainty & Complexity

- Hyper-connectivity is leading to uncertainty and hence the rise of complexity
- Traditional tools struggle with uncertainty and complexity.
- Need for more flexible, pluralistic methods that can help select right tool for the right task.

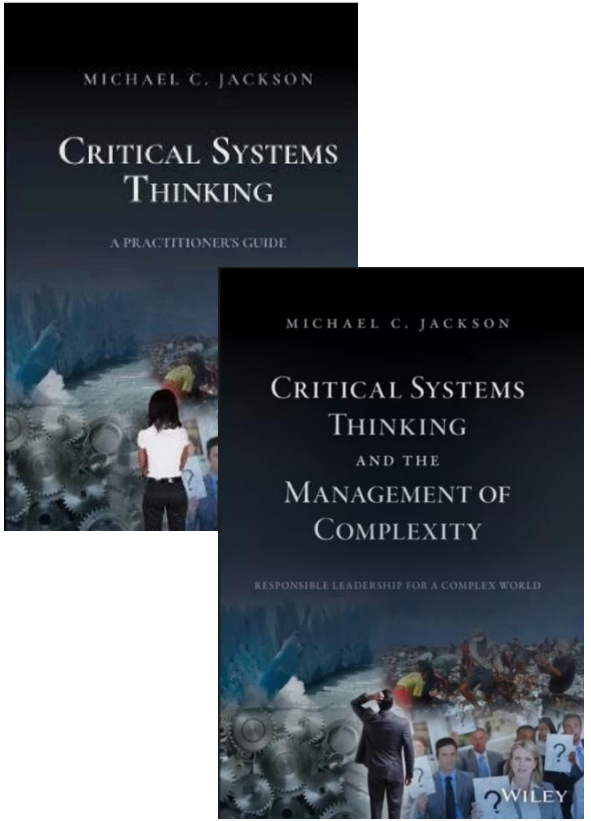
Figure 1: Monthly Global Economy Policy Uncertainty Index (Baker et al., n.d.)

Limitations of current methodologies

- Complexity is often poorly defined.
- Tools built for specific problem types, often unknowingly, and hence may be applied to wrong problems
- Competing philosophies and patterns → limiting effectiveness.

Towards a Pluralistic Approach

- As stated by Mike Jackson
  - Different system views lead to different solutions
  - These solutions are useful for some contexts, BUT NOT ALL
  - Need to define problematic areas and choose tools that solve that problem
  - Mike Jackson used Systemic Perspectives (Highly recommended insight)

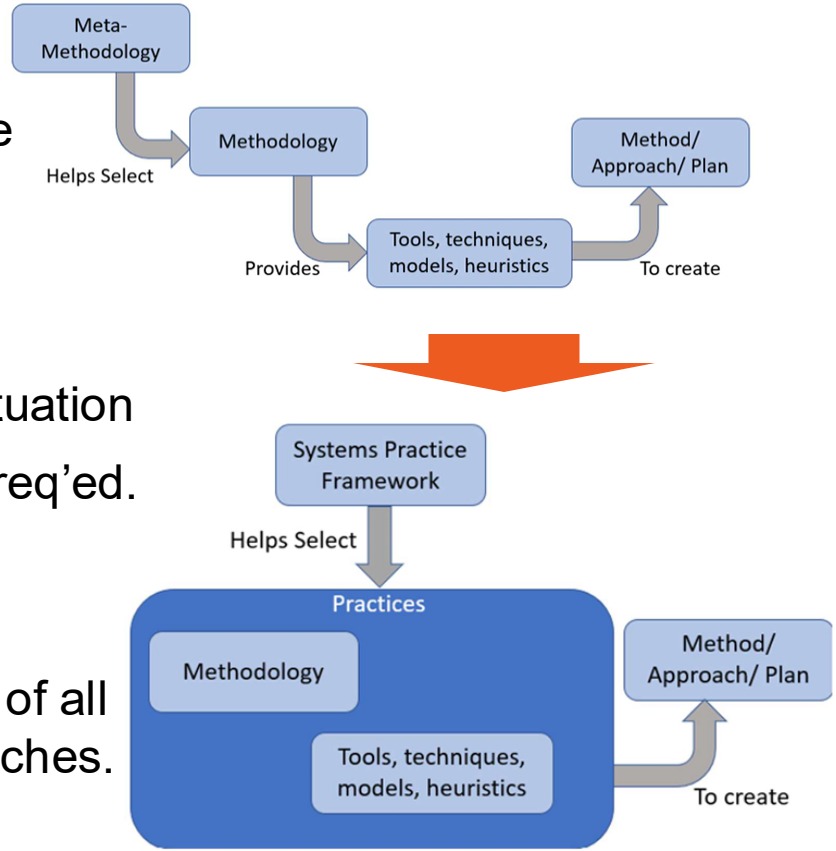


Systems Practice Frameworks

- There are a range of authors who apply the following approach to their work including Jackson.

1. Understand your problem situation
2. Select practices based on the problem situation
3. Iterate, review if it worked and repeat as req'ed.

Rather than constraining to just selecting methodology, SPF's allows for consideration of all practices to create/mix your methods/approaches.



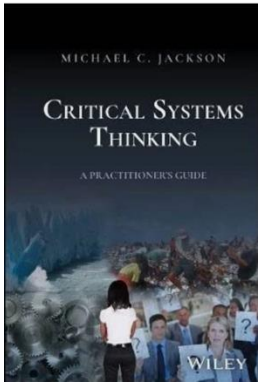
Purpose

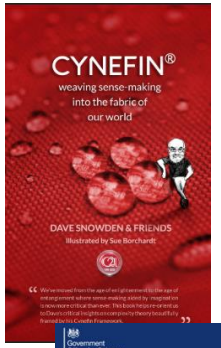
Purpose of this paper was to compare SPFs to:

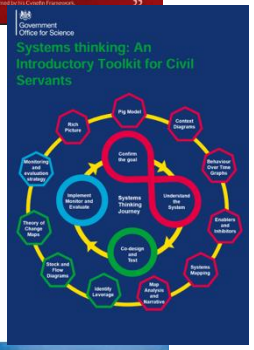
- Determine if insights to improve can be shared
- Determine suitability of each

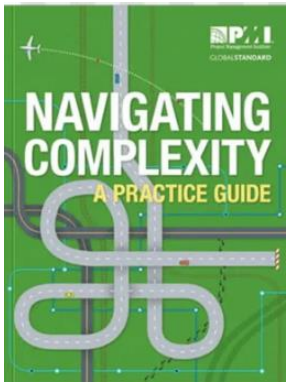
Following SPF's compared

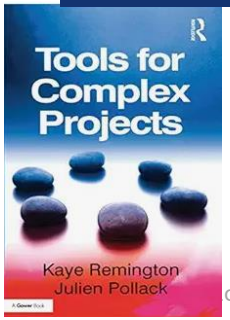
1. EPIC – Critical Systems Practice- Mike Jackson
2. Navigating Complexity – Project Management Inst (PMI)
3. Systems Thinking Tool Kit, - (GO-Science, StiG), UK.
4. Tools for Complex Projects, Remington & Pollack
5. The Cynefin Framework- David Snowden











Evaluation Framework

Objective assessments:

- How many challenge categories?
- How many practices to address challenges?
- How independent advice from author?
- Approach

Subjective

- Breath of challenges considered
- Clarity: communicated complexity clearly
- Usability (easiness to apply)

EPIC – Critical Systems Practice

Title	Book: Critical Systems Thinking: A Practitioner Guide (Jackson, 2024)
# Categories:	5 systemic perspectives
#Practices:	11 methodologies mapped to types of challenge being faced.
%Independent:	100% Work of others taking a pluralistic approach, with added perspective
Analysis Approach:	Review the five systemic perspectives: Mechanical, Interrelationships, Living, Organ-ismic, Environmental/Societal, and select which is currently primarily and secondarily most difficult for the problem.
Advice Approach:	Consider methodologies from the top two systemic perspectives selected, using Criti-cal Systems Thinking.
Review plan:	Iterative EPIC loop: (1) Explore the situation of interest, (2) Produce an intervention strategy, (3) Intervene flexibly, (4) Check on Progress, if not working review approach.
Breadth:	[Green] Naturally Holistic.
Complexity clarity:	[Green] Suitability of tools for problem types clearly communicated.
Usability of SPF:	**[Red]** Requires a dedicated effort to develop a suitable understanding of the systemic perspectives and how to implement the approaches.

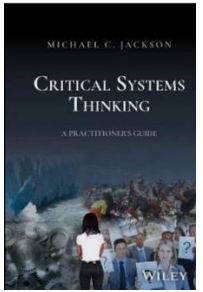


Table 1: Analysis of Critical Systems Thinking: A Practitioner Guide

Navigating Complexity

Title	Book: Navigating Complexity (Project Management Institute, 2014)
# Categories:	**3**
#Practices:	**11** listed, but points to lots of the other advice.
%Independent:	**0%** The advice is provided, or points to other PMI developed products.
Analysis Approach:	After reviewing the book, (1) take an assessment of 48 questions, (2) determine causes of complexity (human, system or Ambiguity), (3) review scenarios, (4) apply critical thinking to content, including PMI techniques, (5) build an action plan using PMI guidance.
Advice Approach:	Choose from a range of PMI-published manuals, plus consider other approaches (not described).
Review plan:	An iterative loop of steps 1-5 above, followed by step (6) Continuously assess the impact (similar to CSP).
Breadth:	**[Amber]** As it is based on PMI publications and one complexity type split across system elements.
Complexity Clarity:	**[Amber]** References many manuals for non-adaptive systems, but includes some advice specific to complex adaptive systems.
Usability of SPF:	**[Red]** Many steps that require consistent manual support are required to implement, as they are not readily memorized. Difficult for a team assessment in a sensible timeframe.

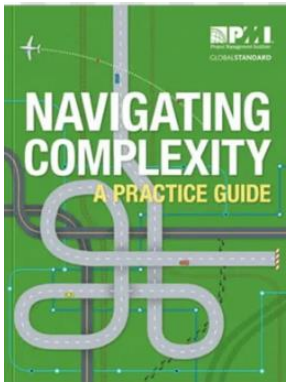


Table 2: Analysis of Systems Practice Framework

Systems Thinking Toolkit for SE

Title	Online Manual: Systems Thinking: An Introductory Toolkit for Civil Servants (UK Government Office for Science, 2024)
# Categories:	**4**
#Practices:	**11 Tools**
%Independent:	**100%** As it points to tools and techniques developed by others.
Analysis Approach:	Determine what lifecycle stage applies: (1) confirm the goal, (2) understand the system, (3) co-design, and (4) implement, monitor and evaluate.
Advice Approach:	Users experiment with tools discussed and associated with the Lifecycle stage. Seven tools are associated with stages 1 and 2, three tools are associated with stages 3, and one tool is associated with Stage 4.
Review plan:	Step 4 includes evaluating the impact of change.
Breadth:	**[Red]** Purposefully limited to simple-to-use tools only.
Complexity clarity	**[Amber]** **References** only more straightforward tools for non-system engineers to be used by all Civil Servants which can be useful for both complex and complicated challenges.
Usability of SPF:	**[Green]** **Straightforward** tools were described, and examples were given on how to use them, making adoption easy.

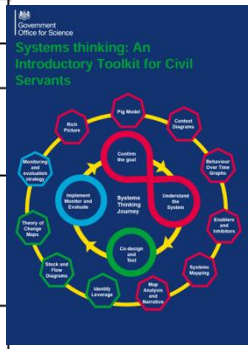
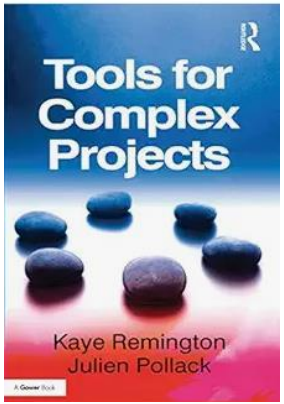


Table 3: Analysis of Systems Thinking: An Introductory Toolkit for Civil Servants

Tools for complex Projects

Title	Book: Tools for Complex Projects (Pollack & Remington, 2007)
# Categories:	4
#Practices:	14
%Independent:	**Difficult to determine:** many of the practice's titles are not well known, but all reference material to justify their approach and some use recognized techniques.
Analysis Approach:	Determine what type of complex problem is present from the descriptions of structural, technical, directional, and temporal complexity. It then indicates which practices are suitable for that type of complexity, with practices being suitable for multiple types of complexity (unlike CSP). It indicated that traditional (non-complex) projects should use traditional techniques.
Advice Approach:	Chapters introduce types of complexity and give broad advice on each. Then, with an understanding of the complexity type present, review those tools marked as relevant to that type of complexity, consider the level of skill and time required to operate, and choose a suitable tool. These tools should then inform the method. 14 tools are mapped to a mixture of the four types of complexity.
Review plan:	Consider how the Complexity score changes as the system develops through its lifecycle.
Breadth:	**[Amber]** The advice covers a range of challenges but is limited in scope.
Complexity clarity:	**[Green]** Recognizes and separates out Traditional from Complexity tools.
Usability of SPF:	**[Amber] Categorizing** types of complexity is fairly simple, but the lack of familiarity with the practices recommended makes it more difficult.

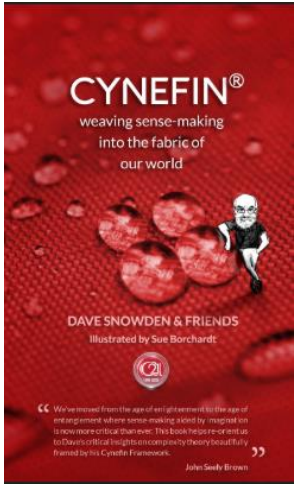
Table 4: Analysis of Tools for Complex Projects



The Cynefin Framework

Title	Publication: Cynefin Framework (Snowden & Boone, 2007)
# Categories:	5, 6 if you use confusion and aporia.
#Practices:	**Heuristics and advice only**
%Independent:	**0%**
Analysis Approach:	Determine what description from clear, complicated, complex, chaotic and dis-order (split into confusion and aporia) categories best matches the problem by considering the cause and effect relationship. Complex is defined as a cause and effect that is coherent in hindsight and does not repeat.
Advice Approach:	Advice provided for each category starts with memorable Heuristics (e.g. Probe-Sense-Respond). Other advice is to navigate the journey around the framework as the problem changes to aid decision-making. Cynefin treats all complexity similarly and tends to provide the author's advice. Pointing to other tools and techniques is not a focus point.
Review plan:	After each intervention, review the impact on the problem, recategorize it, and adjust it.
Breadth:	[Amber] Considers one complexity category, with limited breadth of guidance as designed as a Decision Framework.
Complexity clarity:	[Green] Approach clearly differentiated between complicated and complex.
Usability of SPF:	[Green] Significant value can be extracted, even with a limited understanding of the whole.

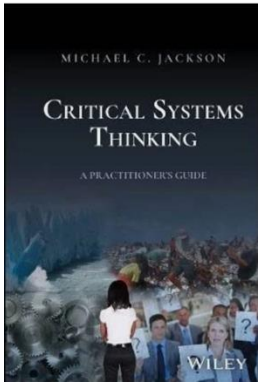
Table 5: Analysis of Cynefin Framework

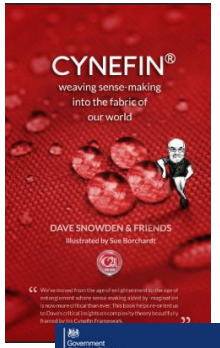


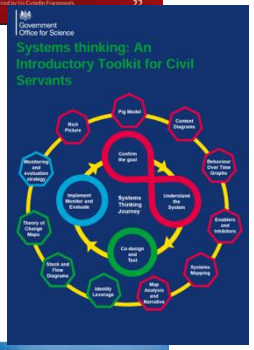
Results

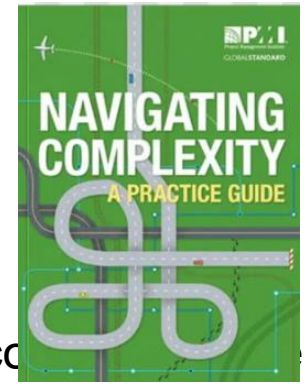
- Critical Systems Practice (CSP) =14
- Navigating Complexity =10
- Systems Thinking Toolkit =10
- Tools for Complex Projects =14
- The Cynefin Framework =12

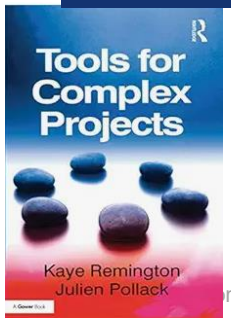
- EPIC/ Critical Systems Practice considered most co





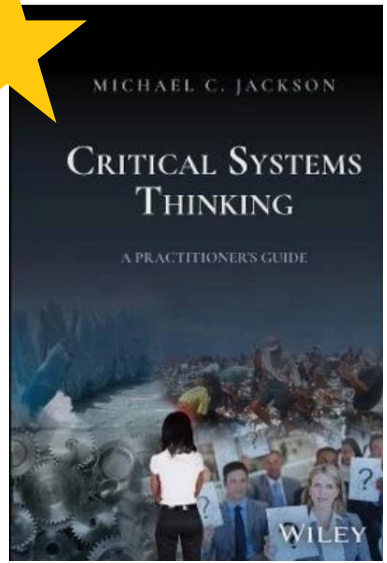






Discussion

- Critical Systems Practice most useful but could be improved if:
  - Simplify systemic perspective descriptions
  - Include more practices per category
- Could it be possible to strengthen future SPFs by broadening advice via community input
- It is essential to maintain low cognitive barrier



Conclusion and next steps

- SPFs vital for tackling modern system challenges
- Recommend community-driven development
- Recommend pluralistic approach
- Focus on breadth + usability = adoption

- Input used to inform development of the INCOSE Tradecraft Guide product which includes Systemic Perspectives & EPIC

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