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## Book Review

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**Systemic Thinking: Fundamentals for Understanding Problems and Messes**

**by: Patrick T. Hester and Kevin MacG. Adams**

**Published 2014**

**by Springer International**

**Cham, Switzerland**

James Gleick first introduced a large audience to chaos theory. He stated in the preface to his best-selling book that “Now that science is looking, chaos seems to be everywhere” (Gleick, 1987), project managers and engineers *everywhere* have been looking for a no-nonsense guide to what has come to be known as complexity. While there have been continued refinements of the definition of complexity (Johnson, 2007), along with the development of approaches to parts of the problem [including a special edition of this journal (Krahn, 2012)], there has been no structured approach to dealing with the chaotic world that engulfs many major projects in the 21st century. Patrick Hester and Kevin Adams take the task head on and have succeeded to a substantial degree; however, this book is not for the faint of heart. *Systemic Thinking* moves at a rapid pace and is brimming with references to underlying scholarship which, due to the brevity of the book, are summary in nature – depending on the reader’s familiarity with the concepts mentioned or diligence in accessing the well-structured reference sections.

Hester and Adams begin by framing the subject of complex problems. The authors use the classification introduced by Funke (1991), who stated that complex problem solving situations shared several attributes: lack of available information; players with many different goals; complexity, which he defined as connectivity between variables coupled with the nature of those connections; a dynamic nature (time pressure and/or lack of comfort with unresolved situations); and finally, the dynamic nature was juxtaposed with time delays before actions took hold. Hester and Adams add to this list significant uncertainty (combining known unknowns and unknown unknowns) and ‘humans-in-the-loop’, wherein concerns of ergonomics, fatigue and operator error could impact the solution of the problematic situation. After presenting this potentially daunting list of attributes, the authors pose the question: ‘So, what is one to do?’ Indeed, this is, without doubt, the fundamental question. To address the question, the authors guide the reader through a succinct refresher in systems theory that involves less than 80 pages (but makes use of more than 220 references) and then set to the task of defining a pragmatic approach to dealing with complexity.

In the first part of the book, entitled *A Frame of Reference for Systemic Thinking*, Hester and Adams describe the theoretical background for a new and comprehensive approach to complex problems.

They begin by describing a simple problem solving cycle: think, act, observe; fans of J. Edwards Deming will note a similarity to the plan, do, check, act (PDCA) cycle which he made famous [but which was posited by Shewart (1939)]. The authors go on to explain that the focus of systemic thinking and this book is, not surprisingly, only the first step: understanding and development of thoughtful actions (other steps are covered, but to a lesser degree). A discussion of systems errors (Types I, II, etc.) and performing theory-informed observation make up the remainder of the introductory chapter.

Next, Hester and Adams differentiate between mere problems and ‘messes’, a term they attribute in this context to Ackoff (1979). They note that dealing with messes involves proper perspective, holistic understanding (both technical and social factors), and thoughtful problem formulation. The authors remind us that “the way you state your problem frames your decision... [p]osing the right problem drives everything else” (Hammond et al., 2002).

Systems theory is tackled next. Hester and Adams provide a short history of background topics, drawing upon a broad set of disciplines (philosophy, biology, mathematics, etc.); this is followed by a short discussion of systems theory, including discourses on each of the seven axioms they have previously used to describe the theory (Adams et al., 2013; Adams, 2012). At this point, Hester and Adams have completed establishing the groundwork for systemic thinking.

Part 2 of *Systemic Thinking* lays out a framework for applying this innovative methodology to messes. Hester and Adams chose a simple structure for this initial application; they address mess management and resolution from the perspective of: who, what, why, where, how and when. When addressing each of these lenses through which a mess can be observed, the authors first provide a discussion of tools to be used to build understanding of each of the perspectives and then conclude with what they call a ‘framework’; that is, a process for utilising the tools described.

The ‘who’ of systemic thinking is focused on stakeholders and builds on previous work by the authors (Hester et al., 2012). It addresses identification and classification of stakeholders along with the evaluation of their attitudes towards the problem(s) of interest. The discussion then moves on to describe:

- 1 a rational methodology for prioritising engagement of stakeholders
- 2 the evolution of those priorities into a management plan for stakeholders.

Hester and Adams now move to the heart of the matter: understanding the system of problems that make up the mess – the ‘what’. They begin by briefly addressing the basics of decision analysis and progress to the development of the anatomy of a problems, differentiating outcomes, outputs and goals, and then examining the use of weighting considerations. In assessing the model of the mess that emerges from such analysis, the authors draw upon two important systems ideas: the Pareto principle and the concept of satisficing. These ideas are powerful tools for prioritising both analysis and action, especially in complex situations where the solutions to all problems may be neither opportune nor even feasible.

Next, the authors turn to asking ‘why’? Here, Hester and Adams probe motivations; that is, for the problems making up the mess, how to model motivation and feedback, between and among the various stakeholders. To do this, they summarise existing theories of motivation and then present two meta-theories that can be used to integrate an understanding of motivations. After doing so, Hester and Adams select Klein’s model of

integrated control theory of work (Klein, 1989) for use in their application framework for this perspective.

Moving to the ‘where’ perspective, the authors address the ‘circumstances, factors, conditions, values, and patterns that surround’ the problems that make up a mess. Hester and Adams break this material down into two overarching subjects:

- 1 context, providing several definitions (including their own, comprising five elements), along with a discussion of the temporal nature of context
- 2 the boundaries of a mess and its constituent problems, addressing the importance of boundary establishment, which separate the mess from its environment.

In *Systemic Thinking*, the ‘how’ refers to the means used to achieve goals of importance to outputs and outcomes of problems. The means are the mechanisms through which adjustments are made to the problem state; Hester and Adams describe means and mechanisms and place them into perspective within decision science and decision analysis.

The final perspective addressed by the authors is the temporal aspect (the ‘when’). In this discussion Hester and Adams address two major topics: the maturity and stability of the mess and its constituent problems. They describe a notional life cycle of problems, how problems evolve, (including the role that entropy plays in problem evolution) and then use this information to develop a framework for systemic intervention – which is further described in a concluding chapter.

The book is laid out with use as a college text in mind. The authors’ clear and consistent chapter structure facilitate its use in the classroom. The comprehensive theoretical treatment and the subject matter are probably better attuned to graduate-level students. Each chapter begins with a well-written abstract that succinctly describes what will be presented. The outline structure of the text provides the reader with a clear understanding of the organisation of the subject matter. The chapters are replete with figures and tables to reinforce the text and improve the reader’s understanding of the often thorny issues being explained. The chapters conclude with a concise summary of the major ideas and then a list of references, placed as end notes. The references are a major strength of the book – I counted about 500 of them. It is this comprehensive use of references, meticulously integrated into the text, which allows Hester and Adams to so competently cover such a ground-breaking topic in a mere 230 pages. Further, the combination of clear abstracts, a consistent outline structure, copious use of figures and tables, summarisation and authoritative references, should also draw the attention of reflective practitioners looking for assistance in one or more facets of mess management. Thus, *Systemic Thinking* will make a worthy addition to the libraries of systems scholars, along with, teachers and practioners of systems engineering.

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