ENGINEERING SYSTEMS REFERENCES

The Art of Problem Solving, Russell Ackoff, John Wiley & Son, Inc., Toronto, 1978.

An interesting book by an early worker in the field. He emphasizes the ill-structured nature of most interesting design problems (which he calls "messes") and is skeptical of OR's ability to contribute.

Design Rules, Carliss Baldwin and Kim Clark, MIT Press, 2000.

I'm still reading this.

Systems Engineering and Analysis, 3rd Ed., Benjamin S. Blanchard and Wolter J. Fabrycky, Prentice Hall, Upper Saddle River, NJ, 1998.

The Systems Approach, C. West Churchman, Dell Publishing, New York, 1979.

Management: Tasks, Responsibilities, Practices, Peter Drucker, Harper and Row, New York, 1973.

A comprehensive classic by the inventor of modern management -- still an active author in his 90s.

How Hits Happen: Forecasting Predictability in a Chaotic Marketplace, Winslow Farrell, Harperbusiness, July 1998.

Farrell, a management consultant, applies the principles of complexity to marketing. It is quite readable but some is not very rigorous.

Principles of Systems, Jay Forrester, 1960.

An early classic.

The Tipping Point: How Little Things Can Make a Big Difference, Malcolm Gladwell, Little, Brown & Company, 2000.

This is a pop book -- actually on *The New York Times* best seller list. He talks about "epidemics" of a variety of types and why they occur. Little things can "tip" a routine book into a best seller, can lower crime rates (by cleaning up the graffiti), etc. "Tipping" has three drivers -- a high degree of contagion, "little changes have big effects", and dramatic rates of change. These relate to some concepts of complexity and chaos. This is a quite accessible book and a quick read. Ultimately, the book runs out of steam -- after a while just good stories that don't really seem to support his hypothesis -- but some interesting ideas.

Hidden Order: How Adaptation Builds Complexity, John H. Holland, ----------.

Holland is from the Santa Fe school of complexity (Gell-Mann et al.). This is a good little book that captures much useful thinking. He starts with "basic elements": agents, meta-agents and adaptation and the idea of "complex adaptive systems" (*cas*). His metaphor is evolutionary biology, although his examples are more broadly drawn, such as a large city -- indeed, that is his first example. He defines four properties -- aggregation, nonlinearity, flows and diversity -- and three mechanisms -- tagging, internal models and building blocks. He develops the idea of adaptive agents, rules and emergence and, finally, a software model called "echo" based on sites, resources and strings, which he uses on some simple cases to show how organization emerges.

He says we are far from a theory of *cas*, but says a theory will probably be based on

- Interdisciplinarity
- Computer-based thought experiments
- A correspondence principle (Bohr) -- "our models should encompass standard models from prior studies in relevant disciplines"
- A mathematics of competitive processes based on recombination -- "Ultimately, we need rigorous generalizations that define the trajectories produced by the interaction of competition and recombination… an appropriate mathematics must depart from traditional approaches to emphasize persistent features of the far-from-equilibrium evolutionary trajectories generated by recombination.

One key idea: adaptable systems become complex!

Rescuing Prometheus, Tom Hughes, Pantheon Books, New York, 1998.

This book is an instant classic. It discusses the history of the "system approach". It includes fascinating discussions of how large-scale, technological systems -- including the Central Artery/Tunnel, ARPANET, large-scale weapons systems -- get designed and deployed in political contexts.

At Home in the Universe, Stuart Kauffman, ----------.

Simulation Modeling and Analysis, 2nd edition, Averill Law and W. David Kelton, McGraw Hill, 1991.

The standard text in probabilistic discrete simulation modeling.

Design and Planning of Engineering Systems, 2nd edition, Dale D. Meredith, Kam W. Wong, Ronald W. Woodhead and Robert H. Wortman, Prentice Hall, 1985.

Butterfly Economics, Paul Ormerod, Pantheon Books, New York, 1998.

A new general Theory of Social and Economic Theory. I found this to be a very interesting book. He talks about complex systems, and especially

- The behavior of individuals being affected by other individuals
- How simple individual rules of behavior lead to complex behavior at the system level
- The inherent unpredictability of the short-run behavior of economic and other social systems
- And hence the futility and perhaps counter-productivity of government intervention to try to influence (e.g.) inflation or unemployment
- His scorn for academic economists with their emphasis on "maths" and their lack of concern for testing their findings/models against empirical data
- The economy, not as a machine, but as more like a biological system

Normal Accidents: Living with High Risk Technologies, 2nd ed., Charles Perrow, Basic Books, 19--.

Perrow, a sociologist at Yale, has done the seminal work in this area. His premise is that technologically-based systems become so "complex" and closely coupled that accidents (e.g., the Challenger) are essentially inevitable. Originally published in 1984. His new edition reflects additional thinking.

The Art of System Architecting, Eberhardt Rechtin and Mark Maier, 1997.

Need to say something...

The Reflective Practitioner: How Professionals Think in Action, Donald Schon, Basic Books, New York, 1983.

This is an excellent book. It emphasizes various modes of thinking about problem solving, especially design, from several professional perspectives.

The Art of the Long View: Planning for the Future in an Uncertain World, Peter Schwartz, Currency Doubleday, 1996

An excellent book on building scenarios as a part of strategic planning for large complex systems (such as oil companies—the classic application).

The Fifth Discipline: The Art and Practice of the Learning Organization, Peter Senge, Doubleday, New York, 1990.

Business Dynamics: Systems Thinking and Modeling for a Complex World, John D. Sterman, Irwin Professional Publications, ----------, --, 2000.

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Why Things Bite Back: Technology and the Revenge of Unintended Consequences, Edward Tenner, ----------.

Tenner focuses on why, in complex systems, actions may be counterproductive. Also, he discusses how, when one works to avoid catastrophe, failures may engender chronic problems instead.

Scenarios: The Art of Strategic Conversation, van der Heijden, Kees, Wiley, 1996

A more theoretical approach to scenarios than Peter Swartz' noted above.

Complexity, M. Mitchell Waldrop, ---------- Press, ----------, --, 19--.

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Chaos Theory Tamed, Garnett P. Williams, Joseph Henry Press, Washington, DC, 1997.

Basic chaos theory starting from ground zero, but you can skip some of the tutorial chapters.

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Systems engineering is an interdisciplinary field of engineering and engineering management that focuses on how to design, integrate, and manage complex systems over their life cycles. At its core, systems engineering utilizes systems thinking principles to organize this body of knowledge. The individual outcome of such efforts, an engineered system, can be defined as a combination of components that work in synergy to collectively perform a useful function. While hams aren't expected to be engineers, it can certainly be helpful for advanced amateurs to avail themselves of engineering textbooks, references, and computer programs intended for students and professional engineers.Â According to Dave, Radio Antenna Engineering was published in 1952, and presents an excellent overview of the state of commercial antenna system engineering as practiced in the first half of the 20th century. Engineering Reference books at E-Books Directory: files with free access on the Internet. These books are made freely available by their respective authors and publishers.Â e-books in Engineering Reference category. Past and Present Energy Societies by Nina MÃ¶llers, Karin Zachmann - De Gruyter Open , 2014 Focussing on a range of Systems engineering (SE) is a transdisciplinary approach and means to enable the realization of successful systems. Successful systems must satisfy the needs of their customers, users and other stakeholders. This article provides an overview of SE as discussed in the SEBoK and the relationship between SE and systems (for additional information on this, please see Part 2) About Systems Engineering. The SE perspective is based on systems thinking. Systems thinking is a unique perspective on realityâ€”a perspective that sharpens our awareness of wholes and how the parts within those wholes interrelate. When a system is considered as a combination of system elements, systems thinking acknowledges the primacy of the whole (system) and the primacy of the relation of the interrelationships of the system elements to the whole.