Systems Thinking: a different way of thinking about our world

(Federico Barnabè)

What is System Thinking?

Daniel Kim (1999, p. 2) provides an excellent and complete definition of what Systems Thinking is, as follows: it is "a way of seeing and talking about reality that helps us better understand and work with systems to influence the quality of our lives. (…). It also involves a unique vocabulary for describing systemic behavior, and so can be thought of as a language as well".

Actually, Systems thinking can be seen from different perspectives.

It is a holistic approach to analyze how systems work and can be managed; it is also a set of techniques and tools that will support analysts, learners, and decision-makers in facing problem-solving tasks and complex issues. And, to a certain extent, Systems Thinking can be also seen as a skill or even a "discipline" in itself (see Peter Senge and his well-known book titled "The Fifth Discipline").

Why and when shall we use Systems Thinking?

As Maani and Cavana (2000, p. 5) state, we need Systems Thinking for a number of reasons that are quite general, that is to say, due to:

- increasing complexity of our lives;
- growing interdependencies of the world;
- revolutions in management theories and practice;
- increasing "global" consciousness and yet "local" decision-making;
- increasing recognition of learning as a key organizational capability".

More in detail, previous research emphasizes that Systems Thinking can be applied broadly and in a variety of fields, but is specifically recommended when the domain under analysis has some of the following characteristics

- the issue is relevant;
- several parts of the system interact giving rise to the specific behavior (or problem) under analysis;
- the problem to be faced is not easy to analyze, and might have been determined by causes distant in space and time (see Figure 1);
- trade-offs among possible solutions may exist.

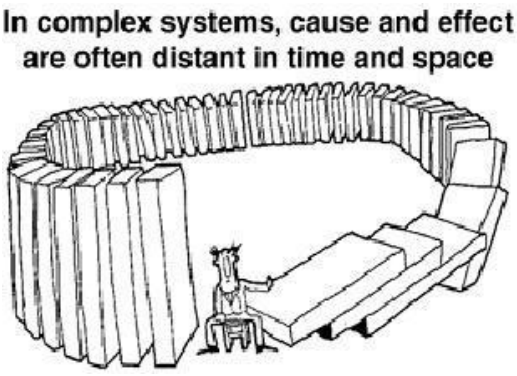


Figure 1: One of the reasons why we need Systems Thinking.

Overall, Systems Thinking help us to inspect, analyze, and evaluate a specific problem in its domain (the "system" under investigation), thereby favoring the gain of policy insights and supporting learning as well as decision-making. As Michael Goodman (1997) underlines "Systems thinking expands the range of choices available for solving a problem by broadening our thinking and helping us articulate problems in new and different ways. At the same time, the principles of systems thinking make us aware that there are no perfect solutions; the choices we make will have an impact on other parts of the system. By anticipating the impact of each trade-off, we can minimize its severity or even use it to our own advantage. Systems thinking therefore allows us to make informed choices".

Where can we apply Systems Thinking?

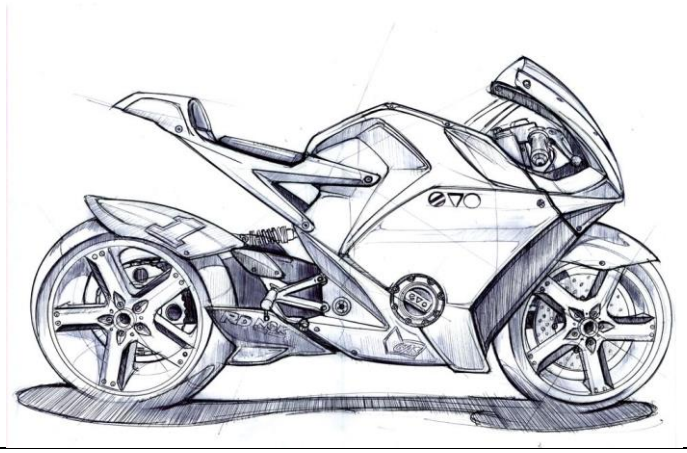
Today, it is widely accepted that Systems Thinking can be applied to study, represent, and manage several domains, thereby facing environmental, economic, and social issues.

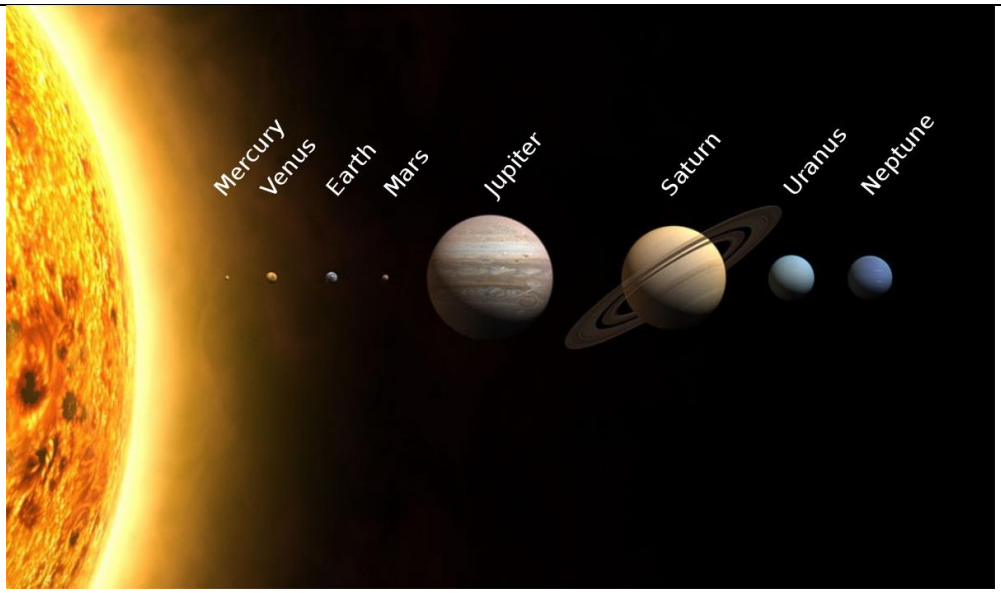
Actually, "systems" are the object of analysis and they are everywhere around us!

As claimed by Daniel Kim (1999, p. 2) a system may be seen as "any group of interacting, interrelated, or interdependent parts that form a complex and unified whole that has a specific purpose."

Systems Thinking examples and objects of analysis are various and numerous and include, just to name a few, eco-systems, physical and technical equipment, and human-based organizations (see Table 1).

Table 1: Examples of systems.

A motorbike	

The solar system	
A factory	

All of these systems are good examples to let us understand the breadth of application for Systems Thinking principles and tools.

It is noteworthy to mention that one of the fundamental ideas underlying Systems Thinking is that a system is not only the product of the interaction of its parts: stated differently (about this also see Donella Meadows and her famous book Thinking in Systems), the whole is more than the sum of the parts, thereby acquiring an increasing relevance and usefulness.

As an example, think about your motorbike. If you decide to take the motorbike apart, it is no longer a useful item – as a whole – since it has lost its primary function.

Hence, when managing those systems, we will need to act carefully, taking into account that a change in one part of the system likely (or, even, inevitably) will affect other parts (over time and across space) and the overall patterns of behavior for the whole system.

In this context, it becomes fundamental to acquire the ability to inspect our systems holistically, going beyond the "simple" event-oriented approach to thinking that we are used to apply in a lot of different domains (usually, with poor results!).

This shift is typically represented as shown by Figure 3.

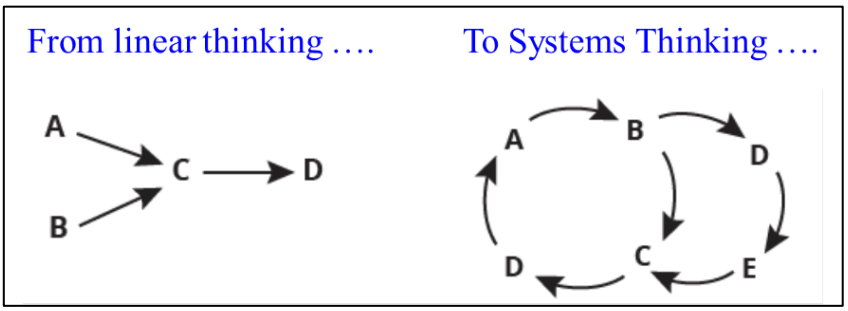


Figure 2: The shift from a linear approach to a loop-oriented approach.

As shown by the figure, it is becoming more and more relevant to be able to change our "traditional" way of thinking and acting, to move forward a different way of analyzing the systems we are embedded in, with specific regard for their underlying structure and the behavior we observe daily. Actually, in Systems Thinking, a system's behavior emerges from the structure of its feedback loops.

How Systems Thinking can help us in practical terms?

Systems Thinking provides analysts, learners, and decision-makers with various tools and techniques that support them throughout the various stages of an intervention.

Key to the technique are the concepts of causal connections and feedback loops.

Subsequently, two relevant tools used in the Systems Thinking field are causal loop diagrams and stock and flow diagrams, as shown in Figure 4.

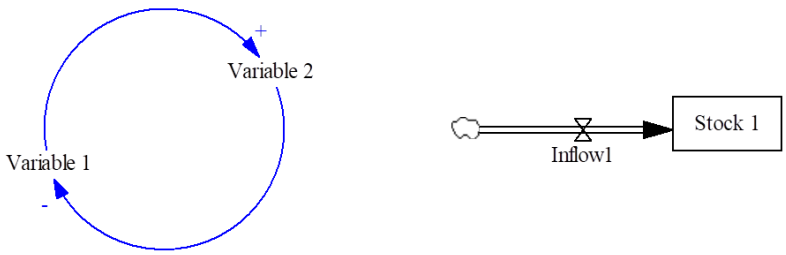


Figure 3: Simple examples of a causal loop diagram and a stock and flow diagram.

The fundamental idea underlying these tools is that the observed behavior of a system is generated by the structure of that system. Hence, analyzing and representing the structure of the system is the key to make sense of what we experience and observe daily in our life and world.

Additional tools (e.g., e.g., simulation models, systems archetypes, and interactive learning environments) will support further in understanding how the system under analysis determines its observed behavior.

Systems Thinking for Project Management

The field of project management may benefit greatly from the use of Systems Thinking principles and tools for many reasons.

First of all, as projects have become more and more complex, there has been a parallel increasing need of techniques to manage such complexity, and this applies to all the projects - even very large ones. Actually, as Sterman underlines (2000, p. 56), “large-scale projects are among the most important and consistently mismanaged endeavors in modern society”.

Secondly, Systems Thinking supports project managers in “representing” their project, thereby clarifying which is the sequence of tasks to be completed over time.

Third, Systems Thinking offers the tools to support project managers throughout all the different phases of their projects, from the design to the implementation. In this context, Systems Thinking will be also helpful in discovering the side-effects of the actions being carried out and the challenges we might be called on to face.

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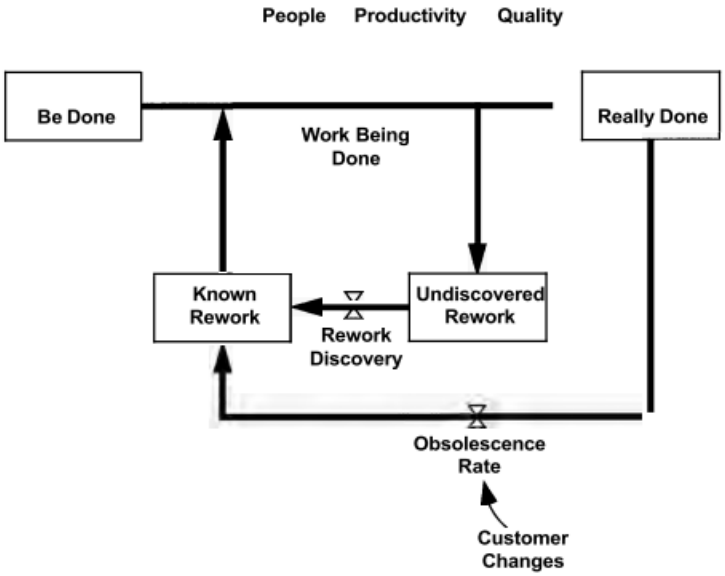

Figure 4: Generic stock and flow structure of a project phase. Source: Sterman (2000, p. 58)

Additionally, Systems Thinking will improve our understanding of what the project will entail, in terms of resources (e.g., financial resources, human resources, and time) needed for its completion.

Last, Systems Thinking will facilitate the understanding of clients’ and stakeholders’ needs throughout the whole project lifecycle.

In brief

Systems Thinking provides a complete set of ideas, principles, and tools to help us making sense of complex and dynamic domains.

Overall, we agree with Daniel Kim in identifying Systems Thinking as "one of the key management competencies for the 21st century" (see https://thesystemsthinker.com/introduction-to-systems-thinking/).

The PMBoG project will certainly offer a great opportunity to put this competence at work!

References

Goodman, M. (1997). Systems Thinking: What, why, when, where, and how. *The Systems Thinker*, *8*(2), 6-7.

Kim, D. H. (1999). *Introduction to systems thinking*. Waltham, MA: Pegasus Communications.

Maani K.E., Cavana R.Y. (2000), *Systems Thinking and Modelling. Understanding Change and Complexity*, Prentice Hall.

Meadows, D.H. (2008). *Thinking in systems: A primer*. Chelsea Green Publishing.

Senge P.M. (1990), *The Fifth Discipline. The Art and Practice of the Learning Organization*, Doubleday-Currency, New York.

Sterman J.D. (2000), *Business Dynamics. System Thinking and Modeling for a Complex World*, McGraw-Hill, Boston.