Systems Thinking

Projects do not exist in isolation; neither do project issues or problems. Crafting successful outcomes and solutions needs a broader framework than simply delivering outputs or solving the current problem. Systems thinking is one way of overcoming a narrow short-term focus in favour of a better all round solution.

Within this framework, a system is viewed as an organised collection of parts (or subsystems) that are highly integrated to accomplish an overall goal[1]. The system has various inputs, which go through certain processes to produce certain outputs, which together, accomplish the desired goal for the overall system. Systems range from simple to complex and there are numerous types of systems:

- Biological systems (for example, the heart),
- Mechanical systems (for example, a thermostat),
- Human/mechanical systems (for example, riding a bicycle),
- Ecological systems (for example, predator/prey) and
- Social systems (for example, communities and project teams).

By definition, a system is systemic, meaning relating to, or affecting, the entire system. This should not to be confused with systematic, which can mean merely that something is methodological. Methodological thinking (systematic thinking) does not necessarily mean systems thinking.

Systems engineering can be thought of as the problem-independent, and solution/technology-independent, principles and methods related to the successful engineering of systems, to meet stakeholder requirements and to maximize value delivered to stakeholders in accordance with their values.

Within this broad framework, systems thinking is a framework based on the belief that the component parts of a system can best be understood in the context of their relationships with each other and with other systems. Its focus is on cyclical interactions rather than linear causes and effects. The approach incorporates several tenets:

- **Interdependence** of objects and their attributes - independent elements can never constitute a system
- **Holism** - emergent properties not possible to detect by analysis should be possible to define by a holistic approach
- **Goal seeking** - systemic interaction must result in some goal or final state
- **Inputs and Outputs** to the system - in a closed system inputs are determined once and are constant; in an open system additional inputs are admitted from the environment
- **Transformation** of inputs into outputs - this is the process by which the goals are obtained
- **Entropy** - the amount of disorder or randomness present in any system
- **Regulation** - a method of feedback is necessary for the system to operate predictably and counteract entropy
- **Hierarchy** - complex systems are made up of smaller subsystems
- **Differentiation** - specialised units perform specialised functions within the system
- **Equifinality** - there are alternative ways of attaining the same objectives (convergence)
- **Multifinality** – it is possible to attain alternative objectives from the same inputs (divergence)

[1] Peter Senge wrote a seminal book about systems thinking, ***The Fifth Discipline*** (Doubleday, 1990).

Complex systems usually interact with their environments and are, thus, open systems[2]. A reasonable sized project is an open, complex, social system made up of many subsystems including administrative and management functions, sub-groups (teams) and individuals, and operates within the larger system that comprises the performing organisation.

Within the project, its subsystems are arranged in hierarchies, and integrated to accomplish the goals of the overall system (the project's deliverables). Each subsystem has its own boundaries of sorts, and includes various inputs, processes, outputs and outcomes geared to accomplish the goal for the subsystem within the larger goal of the overall system.

A high-performance system continually exchange feedback among its various parts to ensure that they remain closely aligned and focused on achieving the goal of the system. If any of the parts or activities in the system seems weakened or misaligned, the system makes necessary adjustments to more effectively achieve its goals.

Consequently, a systems thinking approach to problem solving sees each problem as part of the overall system and recognises that if one part of the system is changed to solve one problem, the nature of the overall system is likely to be changed, as well. Rather than simply comparing its results to what we want it to achieve and then saying it is failing if it doesn't achieve them, we should look at what the system is doing well, and then study how it is designed to do that. Then, if we wish to change the outcome, we can redesign the system for the desired purpose.

Using systems thinking helps us see that what may seem an isolated problem is actually part of an interconnected network of related issues. It helps identify the positive and negative feedback cycles that may be affecting the issue and any associated time lags between the stimulus and the reaction (eg, there is a time lag between adjusting the hot water tap in a shower and the change in temperature of the water leaving the shower head – if you don't allow for the lag, you suffer!!).

Systems thinking is a part of the emerging science of 'systems theory' and offers an incredible set of problem solving tools and techniques to help us understand and optimize areas suffering due to complex problems. Time is taken to understand the 'cause of the cause' of the problem[3] and to map the likely consequences of the solution onto the other parts of the system that may be affected. This is a valuable practice for anyone involved in project management to adopt.

Integrative Thinking

Integrative thinking is similar. Integrative thinkers develop and utilise complex models to understand their situation and drive action. They build holistic models that include consideration of customers, employees, competitors, capabilities, cost structures, industry evolution, regulatory environment, etc. Their models capture the complicated, multifaceted and multidirectional causal relationships between the many variables in any business situation and consider the problem as a whole rather than break it down.

Integrative thinking abilities are based on the management of models, which are an image of reality (systems or processes) that gives a logical interpretation of this reality. Tensions are creatively resolve to produce a more powerful model rather than default to choosing one model over another when both are sub-optimal, but one is less so than the other. Successful thinking is focussed on visualising system, connecting people and creating futures. This approach is useful in both programme management and project management.

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[2] These ideas are closely aligned with complexity theory. For more on this subject see ***A Simple View of 'Complexity' in Project Management***: http://www.mosaicprojects.com.au/Resources_Papers_070.html

[3] For more on problem solving see: http://www.mosaicprojects.com.au/WhitePapers/WP1013_Problem_Solving.pdf