WHAT ROLE FOR SYSTEMIC?

A fashionable approach

Most System Engineering stuff (methods, tools and consultancy relative to requirement engineering, to design, to Safety, to embedded software, to integrated platforms…) feel free to set up System Engineering as a Science. Sure, this straightforward assertion delivered as an evidence impresses the reader, especially when one invokes Systemic, the science of "Complex systems", as the authoritarian argument. The reader usually soon feels uncomfortable to be so ignorant, especially as he comes across oodles of terms (System, system of systems, requirement, component, function, flow, use cases, traceability, sequence diagram, SysML, MBSE, views, specification, design, …) he is of course unable - because no one does - to articulate in an global and efficient picture in connection with his particular motivation. Better then to let such a stuff to "professionals"…

An efficiency that keeps on relying on traditional disciplines

As long as so-called hard sciences are involved, System Engineering and classical physical disciplines may hardly be distinguished. "Modelling", Simulating" and "Virtualizing" may be regarded as a qualitative step forward in the tooling of classical disciplines thanks to the "numerical revolution" leaded by computer guys. As a concession to System Engineering, one may possibly insert some floating "requirements", actually just piece of text without formal connection to the physical modelling but some hand-made dependency links. Yet, as soon as the expression of causality, that is the reason for the correlations between what happens (the imputs) and what is observed (the outputs) no longer depends on energy-mass related concepts, there begins the wonderland…

At best, System Engineering ends up being assimilated to other disciplines that, without such a rigorous theoretical framework to conceptualize causality, at least make possible some regulated objectification and offer thereby an implicitly "weaker" scientific framework. So do software engineering, where buffers objectify dependencies between software modules, and human sciences,

where the human, with all his subjectivity, his feelings and his spontaneous ways of absolutizing, is turned into a measuring device on a statistical basis.

At worst, when the level of entirety at which one stands doesn't make possible to refer to an established discipline, then emerges such wording as "system", "complex", "services", "flows", "functions" eventually allocated to "components", "requirements traceability" … and a reference to Systemic as the fantasized scientific framework that justifies such a mess and the new "Complexity" paradigm that comes with. A closer look shows that Systemic deserves the credit for putting forth that any limit, any stability, if considered as genuinely mirroring "The Reality" , is illusory. But Systemic, as it is, doesn't put forth any solution to fill the conceptual vacuum generated by the renunciation of any absolute concept, nothing that closely or remotely may be regarded as a scientific paradigm according to generally agreed criteria. The famous "complex paradigm" does not exclude nor select anything and is deprived of any measurement theory. Systemic comes down to an invocation: "Open your mind and be cautious when asserting".

Marketing and illusions

Solution makers in the industrial field have to make with. It results in as many "methods" as there are protagonists on the marketplace, all deprived of any serious scientific criteria but the fashionable reference to "Systemic" and some mathematical formalism and modelling apparatus to look serious. At best, they may yield some benefit when designed to fit quite local problematic or when connected to traditional disciplines such as software engineering or physics, as already stressed. Nevertheless, most big companies keep on pouring money in miracle solutions, in the illusory hope that a formalized and tooled "common sense" will eventually make up for it. Product integration and validation processes must do with costly and time-consuming approximate reinterpretations of what is expected while additional costs and arbitrary constraints are imposed on the design process…. Projects spin out of control or fail, engineers get more and more frustrated …. It's the accepted tribute paid to "complexity". Better eventually relying on informal dialog and adaptation on the fly than getting stuck in some good-looking appealing "solution".

Remember the basics

So, let's now get straight to the point.

Before wasting money looking for white elephants, it's relevant to remember that any serious scientific or technical approach relies on the conceptualization of correlations between public "facts" , better if on traces registered by measure devices. "Facts" stands for the conceptualization of physical interactions between an inner and an outer relative to a given viewpoint.

These correlations, to be reproducible and verifiable, call for some stable causality mechanisms. These mechanism associate external causality factors with internal causality factors, with a stress either on generative processes (an entity as the product of a realization process using some material) or on the entity composition ("characteristics" resulting from interaction between "components" - entity as "system"). The relationship between build models and "Reality" is fundamentally statistics.

Corollary, one may notice that the ever-increasing number of stakes to comply with entails quite different approaches to the design process, each one endowed with specific criteria, knowledge and experience. They delineate entities while devising the causality relations that will make possible to meet their specific goals. Sure, this leads to shared resources and interferences. Yet, at the same time, the necessary evaluation of the result must be conducted against each of the viewpoints that

motivated its development. There is the challenge: regarding the conceptualization of some entity as the result of competing viewpoints while giving the possibility to scientifically evaluate the result, at any stage of the design or knowledge building process, from a specific viewpoint, separately considered. These remarks bear the stamp of common sense. They are applicable to any reality conceptualization process, from hard sciences to human sciences, including to what is referred to as "System Engineering". Yet, up to now, even the most fundamental scientific framework doesn't make it possible to master these relativities.

Initiatives to overcome the deadlock

This analysis endows Systemic with a vocation of its own: setting up a scientific and conceptual framework any discipline with the ambition to tackles Reality should conform to, and words are no enough…

Such a vocation calls for a mathematized approach physically meaningful that defines unambiguously and generally standardized descriptional roles entailed by any conceptualization process. And such a construction of general application must of course comply with the formalism of existing scientific disciplines that proved themselves, endowing them with the new potential that results from the clarification made possible.

Some very few have undertaken this upheaval that questions our most spontaneous way of regarding this Reality we are part of, both psychically and physically, and that we contemplate from the inner.

To have glance at such initiatives:

- https://www.mugur-schachter.net/
- http://www.mersyse.com/

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