

Science & Engineering of Business Systems

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We are surrounded by the systems involving people, technologies and processes better known as the "business systems". They function well despite all deficiencies, imperfections and lack of coordination while creating the wealth and moving the world's economy forward. However, it seems that the practice of business systems is well ahead of the science of business systems.

Thinking about world's economy as the business ecosystem, implies dealing with large-scale systems, saturated with complexity, high uncertainty and rapid dynamics. As such, the large-scale business systems should represent an excellent playing field for the multiple, multi-faceted scientific disciplines and scientists, while, for the various reasons and causes, they are or disregarded or sometimes even carefully avoided.

The Four Natural Phenomena

Surrounded by Nature, we have looked for useful and inspirational lessons, analogies and similar behaviors. Scientist looked into Nature to analyze and understand and engineers looked into Nature to synthesize and create. Despite this apparent contradiction (science vs. engineering), advances in one field have always had the positive impact on another. Here, we single out the following scientific phenomena consistently present in all large-scale systems.

1. Growth and shrinking are analyzed in order to elucidate the laws of growth of large-scale systems which will not only explain the inside structure and dynamics but will also provide the basis for predictions and forecasts.
2. Evolution and renewal are studied in prolonged time frame trying to capture influence factors and key characteristics. Long-living business enterprises are exhibiting some evolutionary behaviors.

3. Causality and correlation are important to understand as cause and consequences in analysis, synthesis and decision-making context are not always clearly cut or well understood. Especially in the large-scale systems.

4. Adaptation is related to all previous factors and could be summarized as the quest for survival. It embodies the natural phenomena of competition, cohabitation, collaboration and confrontation.

Three Architecting Principles

Central to the modern business enterprise is the role of IT infrastructure (IT fabrics = people+ processes+ tools) as it provides communication, collaboration and coordination facilities. Business chores executed via IT fabrics are, in themselves, large-scale, dynamic phenomena, as companies are immersed into markets and exposed to regulatory forces, financial objectives and competitive pressures.

On the engineering side, we may observe the following activities as closely related to the previously mentioned natural phenomena:

Architecting of the large-scale systems requires creation of the visionary blueprint which will take into account changes on the longer time-scale and fit new requirements and changing circumstances.

Engineering should provide dependability, usability and reliability features through the evolving technology refresh cycles while fitting into an architectural blueprint.

Development should be done so to provide the above-mentioned engineering qualities while balancing them with cost/time/effort constraints.

The final outcome of these activities we would like to label as "3E": evolutionary, efficient and elegant (architecture/design/development) as the three fundamental, guiding principles.

Emergence of Hybrid Systems

Understanding the entire context, guessing behavioral dynamics under an endless flow of events and pressure of data streams poses several grand challenges. They are still awaiting the major breakthroughs in the science of business systems enabling thus advances of engineering practice.

Despite of the absence of scientific understanding, these large-scale, dynamic systems are humming daily, while engaging hundreds of millions of people and creating the billions in value and wealth worldwide. This, in turn, also points at the societal and social relevance of the research in large-scale systems.

In conclusion, it seems necessary that we aim at important advances in the science of business systems. Elucidation of the large-scale systems will not only improve our understanding of the past, present and the future, but will also enable resolution of the several mysteries laying between domains of the natural and artificial system, which we may call hence the "science of hybrid systems".