

Let's focus onto the increasing complexity of present organizations and the difficulty we have to manage it. As a A. T. Kearney's study (1) shows it, increased complexity originates from growth. Even if it would be possible to reduce it by outsourcing some activities, it remains necessary to maintain the "variety" required by users. This study does not reveal any metrics but a valuation in terms of number of products/services, markets, channels, customization combinations and so on. Of course, you might translate these figures into graphs such as Petri nets, reckon the probabilities of transition from one state to another and infer any complexity entropy-based indicator uttered in bits (following to the Shannon formula): it is a very pleasant result indeed especially if you have to compare different solutions of reengineering related to architecture, processes, workflows, M & A, investment/disinvestment and so on; but is a hard job to be compared with Herculean labours, without any guarantee of accuracy. Nevertheless, some interesting studies allow to solve problems in some peculiar cases (2). We may quote D. C. Mikulecky of Medical College of Virginia Commonwealth University (3): "The system's important attributes are beyond algorithmic definition or realization by algorithms and therefore not computable". Complexity is not a goal in itself and is a source of costs and heaviness and that you have to remove it when it is not necessary; but you must engage with it when it is useful to make you more influent, more resilient, more competitive and more able to attract customers; dealing with complexity means dealing with all kinds of difficulties occurring because of complex relationships. First of all, we have to do an historical survey for complexity is cumulative and the trend is the superposition of structures and products that are more or less profitbearing and source of improductive costs. In fact, it is tantamount to adapt oneself to the necessity and the environment. Managing complexity is to arbitrate between what is the most profitable for the firm and adding value for its customers -not only in the short term- and what is less , making allowance of the increase of complexity and its possible cost. This method is similar to value analysis but takes into account the complexity cost which you can only evaluate by having a holistic point of view. Indeed, the main feature of complexity is that it results from interdependence of almost every component hence the metaphoric analogy of complex organizations with living systems either at an individual level or at the level of social one; it involves recursive definitions, iterative processes, non-linear relations, delayed impacts, numerous feedbacks, positive or negative, being sometimes multi-nested without speaking of more unpredictable phenomena such as so-called "attractors" and emergence. complex systems behave as a whole and when you modify something in one point, it may have repercussions upon others we might wish to remain unchanged; the recursive mechanisms which take place in complex systems propagate the consequences of any disturbance, either it is caused by the management or by the environment; for instance, if you delete a product, it may diminish the production of a component used in another product and so increase the price of this product; you will have to sell this product at a higher price; the sales will be lower and the unitary cost will increase; this is an endless spiral; you have in this very simple example, not only a recursive relationship but a negative feedback loop which in turn will have other consequences. That is why models (4) are so useful to better seize the dynamics of systems and understand what takes place when changing the value of a

key variable. You will find some interesting thoughts about it into a paper from Mani and Li (5).

Numerous methods were designed to understand and act upon complex systems but, practically, their limits are fastly reached for want of being able to quantitatively express the necessary parameters.

For instance, the concept of elasticity used by economists has meaning only if you get at hand statistical data over a sufficiently long period.; on one hand, those data are seldom representative of a usable sample to perform regression computing because they don't cover a large enough scope; on the other hand, in the case of a long period of time, elasticity itself may change under the influence of various factors and this leads to a kind of meta-elasticity no manager will try to tackle.

Consequently, we must not discard those methods but use them if it is not possible otherwise in a qualitative way, which is nevertheless a good approach to appreciate the direction toward which we have to orientate our decision making.

It will be interesting to benefit by the Forrester model which calls into play flows and stocks linked to information, material, orders, money, labour and assets (6) while taking into consideration their interactions through non-linear relationships and indeed recursive ones, feedback loops and the lag of their influencing such and such parameters.

The role of managers is namely to understand and act upon the structures, the functions, and the behaviour of organizations as Gharajedaghi underlines it; he adds that only an iterative approach may improve a system as a whole by successively changing these characteristics.

- (1) The Complexity Challenge, A. T. Kearney Inc., 2004
- (2) B. M. Arteta, R.E. Giachetti, A measure of agility as the complexity of the enterprise system, Robotics and Computer-Integrated Manufacturing 20(2004) 495-503, Elsevier Ltd
- (3) <http://www.people.vcu.edu/~mikuleck/>
- (4) Jamshid Gharajedaghi, A Holistic Language of Interaction and Design: Seeing Through Chaos and Understanding Complexity, Interact, February 2004
- (5) Kambiz Maani, Anson Li, Counter-Intuitive Managerial Interventions in Complex Systems, The University of Auckland Business School, Auckland NZ)
- (6) Bernhard J. Angerhofer, Marios C. Angelides, System Dynamics Modelling in Supply Chain Management: Research Review, Proceedings of the 2000 Winter Simulation Conference, J. A. Joines, R. R. Barton, K. Kang, P. A. Fishwick, eds