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Software review:

"Decision Explorer" and "Frontier Analyst" of Banxia Software

1. The limitations and the supposed remedies

With the advent of the systems paradigm, back in the first half of the 20th century, it started to be increasingly admitted that side by side with the "reductionist" approach, also the "holistic" one, which looks at the respective wholes, even if not very precisely known and described, may also provide valuable insights. Thus, in numerous cases, when it would turn out impossible to break down the system considered into smaller components and/or individual aspects, each of which could be identified and modelled with adequate precision, and then put together to obtain an image of the whole, techniques were applied trying to address rather the whole than the parts. This has often been motivated by the impossibility of treating systems, which were too large, too complex, and involved a too high degree of uncertainty, both in individual elements, and in their associations. Uncertainty could stem from lack of adequate knowledge, from the inherently probabilistic nature of the elements and their relations, or from the treatment of systems, in which value judgements played an essential role (human systems). Frequently, all of these entered the play.

The approaches, which tried to tackle the "holistic" aspect of systems came from many domains and methodologies. Many of them were the extensions of techniques otherwise quite well established within the "reductionist" paradigm. In these cases the models and images obtained were treated as approximations that can be further refined and made more precise, and ultimately lead to the still expected proper design and prediction capacity.

Yet, in parallel, the approaches and methodologies developed that tried to resolve virtually the same set of issues through the use of a different toolbox, still largely within the reductionist paradigm. These included the meta-heuristics, replacing the classical approaches in a variety of situations, such as identification, optimisation, control, etc. On the other hand, the approaches appeared dealing with various forms and aspects of uncertainty and vagueness in different contexts, such as fuzzy sets, rough sets, influence diagrams, Bayesian networks, and so on. While these methodologies try to preserve internal consistency and rigour, they are often used simply as remedies in situations, which otherwise are hard to tackle, even if the analyst would have preferred a more "square"

All in all, it became obvious that, on the one hand, there are definite limits to the classical reductionist methodologies that cannot now or will never be overcome and, on the other hand, the approaches that do not offer the "ultimate precision" may be of pragmatic value. One important, broad area of application that emerged and stayed was associated with the educational and awareness-raising methods, insofar as these were supposed not to require high precision and actual predictive capacity. Another one has been, and is, the management of large organisations, where an easy insight, clear-cut yardsticks and readily available recommendations were being sought under rather complex circumstances.

2. What is being offered?

It must be admitted that the approaches and related techniques that allow for a "holistic" perspective in situations that are otherwise intractable in a precise, verifiable manner, appropriate, for instance, for the technical design purposes, are perceived in a variety of manners in terms of what they can offer. Thus, in some cases, and for some users, they provide plausible approximations of descriptions of the processes or phenomena, which cannot anyway be described in any other manner. In other cases, and for other users, they would just supply illustrations that can be used for rough "understanding" of the respective system's structure or behaviour.

A good case in point here is provided by the technique of Systems Dynamics. The technique, and the set of software tools related to it, developed from a simple paradigm of approximating the world's (industry's) processes via models involving algebraic and linear differential equations that can be (relatively) easily formulated once we understand the basic mechanism behind the given set of processes and interrelations. It soon turned out that not only the initially assumed class of relations is insufficient for describing the real-world phenomena (e.g. highly nonlinear, spatially distributed ones), but that the facility of constructing quite elaborate and extensive models is not paralleled by the capacity of controlling and analysing such models (instabilities, limited clarity, etc.). On the other hand, though, this approach remained a useful tool of mainly educational significance, valuable for illustrating, and analysing, definite segments of reality for equally definite (e.g. understanding of non-trivial dynamic behaviour) purposes.

Let us indicate yet another domain, which underwent a rapid development during the last decades, and in which the classical "reductionist" or "modernist" approach has also been at least to some extent abandoned (notwithstanding the efforts aiming at preservation of internal consistency). This is the domain of the decision support techniques and computer systems. In deeper intellectual terms this domain has not seen any substantial progress since the time of Pareto, but, on the other hand, the "methodologies", which try to grasp and address various

are oriented, though, not at the subject matter of the decision being made, but at the process of decision making. At the same time, there is no doubt that, after all, the subject matter also matters. It is obvious that the refined DSS applications are largely meant to substitute for the lack of sound knowledge on this subject matter. Hence, here we are back to the issue of treatment of the poorly recognised and analysed situations.

In fact, there are cases, in which a truly modest objective is set forth, namely that of simply "putting things in order", meaning drawing a list of relevant notions, establishing verbal relations between them ("the same", "similar", "opposite", ..., "influences", "is neutral with respect to", ...,), and trying out a limited reasoning or influence propagation within the so defined systems.

3. Scope of application

The tools, which are being developed, may be used for purely educational purposes. This is not merely the area of undergraduate or postgraduate courses (or the high school lessons, as well, for that matter), meant to teach either a definite piece of knowledge on a definite subject matter (ecology, operations research, logistics, ...,), or the way of looking at things (the paradoxes of dynamics). Indeed, these tools are powerful supports for such courses. Yet, their domain of application is certainly much broader.

As we are told that an overwhelming majority of people watching TV – no matter where – perceive only flashing images and a couple of names stuck to a couple of faces, and we learn about the afterschool illiteracy – even in the most developed countries with the schooling indices infinitesimally approximating 100% – the kind of tools we speak of here gains an exceptionally high value. In the world sinking under the burden of "information" (?), with increasingly dense and rapid communication, and more tangible social, economic and political interrelations, the simple functions of "sorting things out", "putting them in place", "establishing links", etc., become crucial for finding one's way around, if not for survival (assuming we are not "the insiders", which is a fairly safe assumption in statistical terms).

Imagine a middle-sized company or any other institution (say, local government). The need for the tools considered arises on virtually all levels of such an organisation. For a member of the board a new project may be a challenge in the technical matters unknown to her or him. Not only this – if it is truly new, it will bring a whole tangle of issues that go along with it, and require an appropriate recognition, analysis, and decision. The quasi-modelling tools are frequently the best choice for (a) learning the contents and scope of the problem, (b) establishing its rough structure, (c) trying out (at least formulation of) various options, including the redefinition of the original problem. By securing a minimum support for these functions, such tools (A) facilitate discussion by providing, even if indirectly, appropriate definitions, (B) bring clarity and

reference material, but, more effectively, as a starting point to the later studies, or even a tool for continued use. Both applications make such kind of use fully feasible, though they are not overly extensive with this respect.

7. Anything else?

As said, the two products evolve, mainly in terms of adjustment to the changing hardware and software environment. In addition, their capacities are being expanded in the consecutive versions. When we think of capacity, we address two aspects: the possibility of including various extras and additional functions, and the possibility of treating larger, more complex problems. Two remarks are due with this respect. As noted previously, while there are functions, which definitely improve the value of the overall product, and facilitate its effective use, there is a certain "saturation" level (complexity of the application), beyond which it is no longer sensible to go, at least within the application context envisaged (see point 6 before). Both applications here considered are well within the sensible area, offering what is needed, and allowing for an easy learning and use. Addition of options and functions could only be justified by the clear advantage resulting from them (e.g. a more elaborate and informative clustering of notions in "Decision Explorer", or a more sophisticated statistical analysis in "Frontier Analyst"?), but should be well thought out.

On the other hand, there is the issue of extensions to the "computational capacity", like treatment of up to, say 1,000 units and 50 variables by the "Frontier Analyst". Certainly, this is not just the issue of scale. Here, obviously, quantity is transformed into quality. The question arises, whether one is dealing with the same sort of problem when its dimension is 10×3 and when it is $1{,}000 \times 30$. In a large share of cases these two problems, even if formulated in an analogous manner, would not be the same ("quantity turning into quality"), and a doubt may arise whether they should be treated with the same kind of methodology. Indeed, why not switch to a statistical tool first (clustering, discrimination, model identification, ...,), and then only try some optimisation-related approaches (DEA, AHP, ...,). Likewise, the technical side of the application would have to change.

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Both "Decision Explorer" and "Frontier Analyst" are highly professional, simple to use products, whose utility, naturally, depends upon the skills and experience of the user, but can certainly be made quite high. The present author is definitely in favour of applications that do not try to impress with the multitude of capabilities and functions ("a thing that does a thousand things may not be doing a single thing well") and the huge ("mega") dimensions of problems that they can treat, but, instead, are simple to make run, use and

specialists in respective methodologies. The two applications reviewed certainly fall into the latter category.

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