AN INTERIM REPORT ON SOFT SYSTEMS EVALUATION

Viljem Rupnik
INTERACTA, LTD, Business Information Processing
Parmova 53, Ljubljana
386 01 4291809, e-mail: Viljem.Rupnik@siol.net

Abstract*:*

As application areas rapidly grow beyond the theoretical framework of fundamental decision theory we are very often temptated to see whether or not soft systems may promise some efficient modelling of real life problems. The pioneering bust towards soft systems methodology has come from the needs of mathematical sociology. Its contemporary definition as well as its applied architecture have been dealt with as in a paper proposed.

Key words: fundamental decision theory, soft system modelling

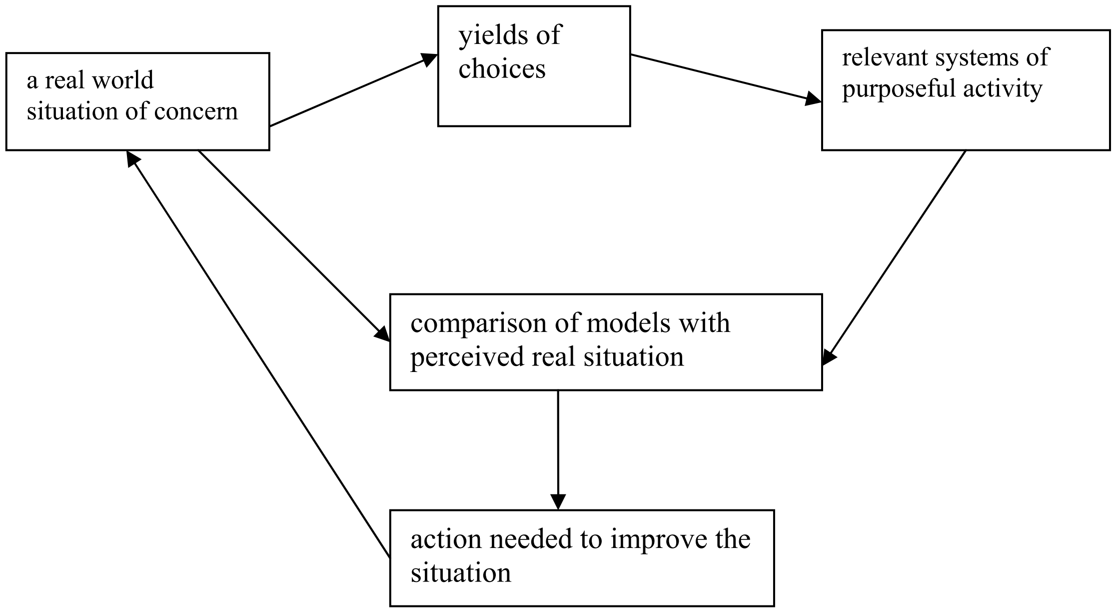
1. AN INTRODUCTION

The original decision theory offers the largest formulation of decision process, compresed through fundamental equation of decison theory (FDT). Since it is a brute force approach, our following its lines of implementation hits upon severe obstacles to satisfying solutions (see /1/). The appearence of soft systems methodology (SSM) seems to be a way out of these troubles, despite many trapping states threatening the application of FDT. To check whether or not the SSM is some step of improved system modelling, we shall here match the two concepts.

As a whole, there are two significant and crucial scientific areas which influence pragmatic reputation of OR: gnoseology and hermeneutics. They interact strongly, especially when SSM is being exercised. Both of them should be taken into account: the first one determines the problem solving procedure and the latter one shapes the scope and depth of its implementation in real business lives.

2. BASIC CONCEPT OF SSM

The most outstanding authors are Peter Checkland and Jim Scholes (see /2/) which introduce basic SSM concept and the possibility to conceive the potential difficulties when applying it. Their book discloses various applications as variations of the basic SSM concept. They are as follow in pure verbal form:



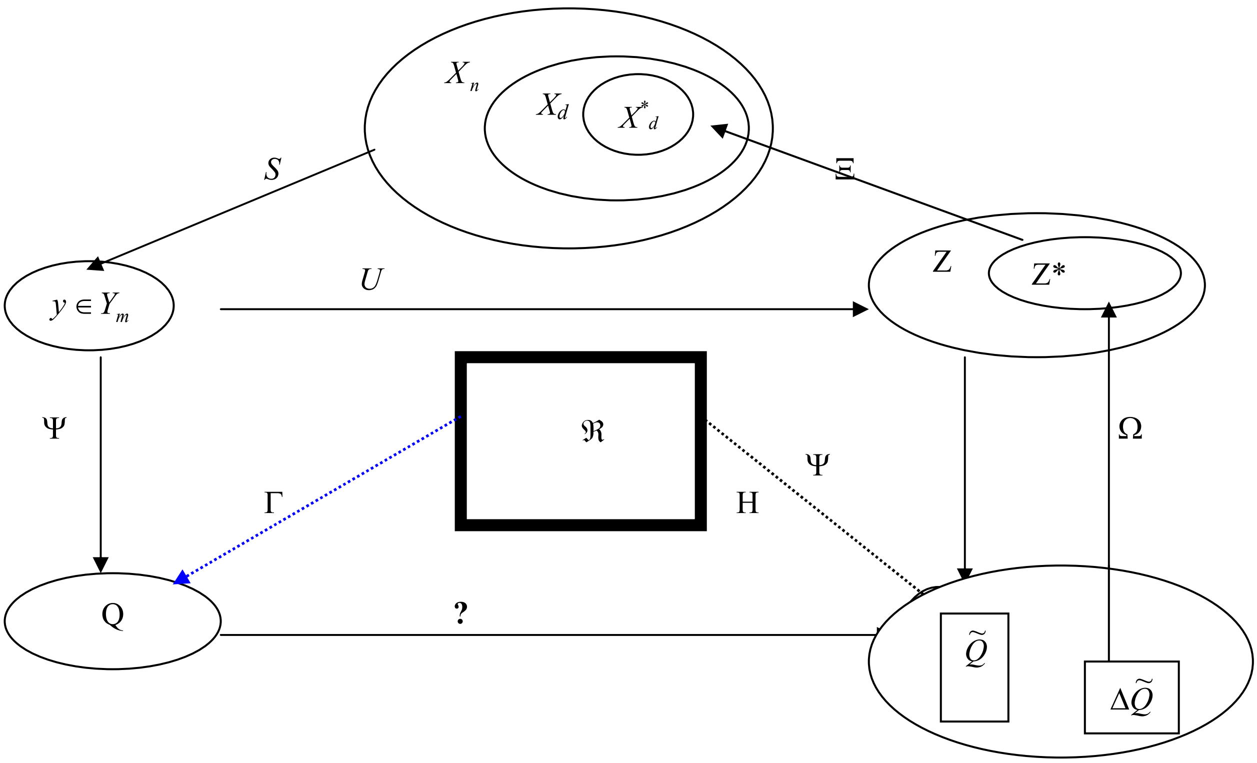
3. BASIC CONCEPT OF FDT

To judge the SSM as it stands today we first have to reinterpret the above miling stones in terms of general decision theory (FDT), which we reproduce as follows. To illuminate it, let us start with general decision theory and its fundamental equation, whose constituents are as follows:

- let X_n be an arbitrary finite dimensional vector space, representing all conceivable decision variables $x \in X_n$; let $\Re$ be an object of decision making process (which, in general, is not a problem itself);
- there is always at least one consequence $y \in Y_m$, again from finite dimensional vector space, corresponding to input $x \in X_n$;
- we also introduce an operator $Y = SX$ producing output from input; let us call it as decision-generator;
- X_a should serves as a space of admissible decision variables, $X_a \subset X_n$;
- let $z \in Z$ be an estimate of a consequence of decision variable $y \in Y_m$ (of an arbitrary dimension);
- there is a mapping U of $y \in Y_m$ into $z \in Z$;
- let $q \in Q$ be a primary (backwards) construction of a problem, based on $\Re$, under the conditions of certainty;
- $\tilde{q} = (z_1, \ldots z_m) \in \tilde{Q}$ as an analogy, let $\tilde{q} \in \tilde{Q}$ be a secondary (backwards) construction of the same problem, based on $\Re$, under the conditions of uncertainty;

- let Φ is a mappping of Y into Q (a primary generator of problem constructions); in real situations, this mapping reduces Q into some part ΔQ;
- for the case of uncertainty, let Ψ maps Z into $\widetilde{Q}$; here again, this mapping may produce some shrinkage Δ of $\widetilde{Q}$;
- the shrinkage of $\widetilde{Q}$ is then projected onto $Z^* \subset Z$ via operator Ω;
- Ξ is an operator of induced subspace $X^*{}_d$ of alternative admisible decisions, being mapped from $Z^* \subset Z$;

Based on these minimal categories of FDT processing the following graph might be useful (see/1/):



3. SSM-FDT MATCHING

Now, the matching is now as follows:

- ***A real world situation of concern*** may be interpreted as $\widetilde{q} \in \widetilde{Q}$ strictly in FDT sense although $\Re$ is not defined and expressed explicitly; consequently, SSM is »dealing« with Γ;
- ***yields of choices*** may be interpreted as $\{z\}$, where $z \in Z$ according to (FDT);

Z* only tends to be reached; consequently, Ξ is not formalised, at least not at each step of approximation;

- ***relevant systems of purposeful activity*** might be roughly interpreted by *U*, ignoring $y \in Y_m$;
- ***comparison of models with perceived real situation*** could be conceived by a pair of Ψ , but $\widetilde{Q}$ and $\Delta\widetilde{Q}$ are not explicitly computed;
- ***action needed to improve the situation*** could be understood as Ω although SSM is not explicitly stemming from $\Delta\widetilde{Q}$; consequently, Z* can not be reached strictly;
- $q \in Q$ is not involved in SSM and, consequently, it can not serve as a basis for $\widetilde{Q}$ and $\Delta\widetilde{Q}$: construction parameters describing $\Re$ do not appear;
- by SSM approach, a fact which worries most of all is that the perception of $\Re$ a) underlies a subjective decription/perception and b) changes over a series of approximations; consequently, it is difficult to expect the procedure to be convergent;
- within the FDT framework we usually simplify »our« space of consequences to be Z=(US)X and thus X=$(US)^{-1}Z$ (if possible?!), and consequently $\Xi = (US)^{-1}$: it means that a) we neglect any alternative solutions, b) we neglect admissible solutions, c) we are too bold to assume that all inputs could be solutions; within the SSM framework these questions are still more obscure:
- in case of FDT the question is whether S is known to us; it is the same with SSM case;
- operator U is questionable in both cases either;
- the two operators *U* and *S* in FED are tacitly assumed to be uncertain: do we use it in a SSM case (or as deterministic operators)?
- in FDT case: are we sure that $\Delta\widetilde{Q}$ is sufficient for our decision on $X^*{}_d$? What about SSM case?
- a similar doubt as to the operators *U* and S to hold true for all other operators in FED as well as in SSM case ;
- a transition from Q to $\widetilde{Q}$ has not been examined whatsoever; it has been a reflection of our dangerous oversimplification of FDT decision proces;
- a bridge between hard and soft sciences is often demolished by using *U*= identity operator which is, in general, very far from being realistic and adequate approach; it may well hapen that an/the solution $y \in Y_m$ is acceptable from technical aspects only, but not from the others;
- in FDT case where we are not worried about making some adequate snapshots of $\Re$ to get problem space *Q*, or, even worse, $\widetilde{Q}$? How about SSM case?

As we may conclude, it is not possible to derive the fundamental equation of decision theory (FED): $X^*_d = (\Xi\Omega\Delta\Psi US)X$ as a counterpart to SSM.

4. EXAMPLES ON SOME REAL LIFE PROJECTS

There have been several projects at the nearest past which induced our tempation to exercise SSM approach. To exhibit some most important features we chose the three projects:

A: The minimal methodology of management and control of agriculture development in Slovenia (see /3/);
B: Network economics modelling on electronic data interchange, developed for ATNET (Advanced technoilogy network) (see /4/);
C. The analysis of New York Stock Exchange operations (see /5/)

The reappraisal of the above projects had been focused in the light of SSM-FDT comparison. The main findings are listed below

resulting features	project A	project B	project C
$\Re$	closer to SSM	fully FDT defined	well FDT defined
Q	large dimensional FDT space, stochastic	small dimensional FDT space, stochastic	variable modest dimensional FDT space, stochastic
$y \in Y_m$	stochastic, closer to SSM space	stochastic FDT space	not defined
Ω and Ξ	stochastic non-formal operators (see /8/)	deterministic FDT operators	stochastic FDT operators
Ψ	loose looped feedback	stochastic FDT operators	mild stochasticity operator (see /6/)
$\widetilde{Q}$	partition subject to interaction analysis	partition arbitrary fixed	SSM conditional partition
X^*_d	no observability	no observability	no observability
Z* controllabilty via $\Delta\widetilde{Q}$	suspected of wild stochasticity, of SSM type	fully enabled, of FDT type	mild stochasticity space, of FDT type
U	requires fluid modelling (see /7/)	piecewise deterministic functional	non-existing

5. A PARTIAL CONCLUSION

It follows from the examples above that neither SSM nor FDT is apt to serve as a complete and satisfactory device of modelling. Each of them should somehow be modified to offset the real situation. Modifications are expected to take place at different constituents of each particular type of modelling discussed above.

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