Published in:
Management, 11, No. 2, (2007), 39-42, ISSN 1429-9321

Does the optimum management for the given economic process exist?

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JEL classification: *C00;C67, C70*

Keywords
Modeling systems and languages, Uncertainty modeling, Management modeling,

Abstract:

The formal proof of the existence of an optimal way of managing some of the economical processes is presented in this paper. It is based on the game theory formalism, and on the von Neumann theorem. A theoretical model of a general matrix game for the management of an economic process was introduced and discussed. It was concluded, that a formal approach towards the management had been compatible with the phenomenological one if the black-box simplification had been used. The presented approach may be applied in some practical aspects of the management art, using the presented formal process description.

In discussions about the management methods and decision making, there are two opposite (different) opinions devoted to the problem of the existence of optimal management procedures and strategies. There are some articles where it is stated that in the turbulent, economic environment it is impossible to find optimal solutions [Krupski 2006]. Also a mathematical approach to the management processes is questioned mainly by humanistic type of authors who try to prove that the complexity of the management makes it impossible to introduce any formal models. In addition the defense of the mathematical point of view is quite difficult, due to specific character of economic experiments. Most of the times it is possible to perform them only once, and they can not be repeated. Only some cyclic processes are suitable for comparison of the yield of the management along some changes of steering perimeters. So it's rather difficult to prove it experimentally. But all of the oppositionists agree with one fact: at the end of the managed process, any number must be created. This is a very important statement, which legitimizes the formal approach to the management processes. This induces also the fact, that all quantified management systems have to be converted to their own numerical representations. On the other hand, any formal approach towards the management processes is strongly required from the informational point of view. Any computational method needs a mathematical representation of the non-mathematical phenomena. This is the sinequanon condition for computer calculations. Based on the above facts it is possible to introduce a very elegant formalism for the description of a management act. Under some constrains to which the management process is subjected; it is possible to prove the existence of the optimum strategies.

Let us assume, that

1. The management process may be formally represented as a two-person game in the game theory sense [Straffin 2002], between the managed system and the economic environment.
2. The managed process inside is a black box [Arthur 2000], but at the beginning some capital (initial value) is put in, and at the end some capital (end value) is the output. The value of the exchanged capital depends on the steering perimeters, which are arbitrary chosen during the management
3. The surround may interact economically with the managed system changing some external macro perimeters easy measurable and understandable (i.e. total market volume, income per capita, economic pressure, etc.), making the capital exchange restricted after the process performing (or close the cycle).

The above statements are sufficient to abstract from the scale of the interacting systems, scale of the process and its character. It has only to be fixed, that the yield of the managed process may be quantified, based on the capital exchange with the surround. So, this way we abstract from the "soft" description of the management such as knowledge management, human resource management, etc. The black box simplification is crucial from the formal point of view. We don't need to discuss the internal relations of the system and its complexity. Just the existence of any process and its depending on some computable perimeters is sufficient. We even don't need to look at the mathematical model of the managed process. [Xie 2004]

Based on the above discussion we will introduce the formal definition of the game.

1. There are two players: the managed system and the economic surrounding.
2. Strategy of the system is to assume some perimeters (e.g. numbers of the different resources, necessary for running the processes) in such way, that the capital exchange with the surrounding will be maximum.
3. Surrounding will take values of the available external perimeters (e.g. income per capita, exchange rate, market price, economic volume, etc.) in such way, that the exchange of capital with the system will be minimal.
4. The game is started with the managed process.
5. The profit in this game is equal to the exchanged value of capital between the managed system, and the surrounding.

The game is matrix a zero-sum type in the case of the equilibrium state, and a non-zero sum one in other cases, when some self running processes appear in the analyzed economic system. It is possible to notice, that the above model of the game is very clear and simple. Most of the economic processes may be subjected to it's constrains without losing the generality. In consequence, we will receive the elegant formal approach, with all benefits derived from the von Neumann theorem.

Each matrix game [m x n] has the solution, that means, that there does exist exactly one number v, named "benefit of the game", and the optimum strategies (pure or mixed) for both players fulfilled the following statements:

- *If for rows, the optimum strategy is chosen, then the achieved benefit for the rows will be not less than v, independently from the chosen strategy for columns.*
- *If for columns, the optimum strategy is chosen, then the achieved benefit for the rows will be not greater than v, independently from the chosen strategy for rows*

So, taking into account the above information, it was proved that in all cases of the economic processes, where the presented model is applicable, **there do exist the optimal management method, and the optimal economic results of the managed processes**.

Conclusions

The presented formal approach to the management phenomena is the voice in discussion about the existence of the optimal methods of management under some constrains. It is the general, formal proof, and the consequences of it are very important for some more detailed investigations. The black-box simplification may be partially removed, and some practical solutions for the processes with well known mathematical models may be calculated. This theoretical proof will also allow introducing some econophysic models to the management processes [Mantegna 1999]. This approach would give the state equation for quantification along the time. The thermodynamic approach to the welfare distribution seems to be especially interesting [Mimkes 2006]. The presented proof does not stay in conflict with the humanistic approach to the management phenomenon. It only abstracts from the internal "soft" relationships inside the black box, giving the measurable input output difference. All the internal relations, describing the phenomenological form should lead to the optimization of the steering perimeters for the managed processes. The "soft" knowledge of the manager is unique in choosing the best initial values not far from the optimum ones. So, both approaches are compatible this way. It also may be concluded, that formal approach to the economical phenomena is always a very strong and useful tool.

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