Use of Simulation in Management and Management Education - Speeding up the Wheel of Learning?

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ABSTRACT

The shortening of product life cycles is one of the big problems to be solved in the 1990s. So a lot of energy is used to speed up the R&D-processes and put more flexibility to the production line. Time is not the only key-variable of the R&D-process and production, quality and individuality of the products are getting more and more important. These variables are not only significant for production and R&D but also for decision making.

The classical way to enhance the quality of decisions is the use of decision-support-systems (DSS), often based on artificial-intelligence (AI). Another tool to improve the effectiveness of decision making is management simulation. These tools are used to assist the decision maker with the goal of „better" results.

Deciding can be seen as a part of the „wheel of learning" (described by Rick Ross, Bryan Smith and Charlotte Roberts in: The Fifth Discipline Fieldbook). So the process of making a decision is an element of the phenomenon learning. Improving decision making implicates improving the learning process not only the quality but also the consumption of time. It is obvious that group learning is much more complicated and protracted than individual learning. Each step of the process could be aided by computer simulation or tools.

During our management courses we use different versions of simulators. This simulators are a „Management-Flight-Simulator" and a „Planning-Game". Both are based on a fix VENSIM-Model, the students are only able to decide on budgeting, staff etc. not the structure of the simulation. This means that the students are trained in System-Thinking and Group-Decision-Making. A third simulator is used in the advanced course of System Dynamics. In this case the students are confronted with a complex VENSIM-Model of a firm, supplier, competitor and market. They are told to analyse and improve several parts of this system. The goal is to implement better rules of decision and to sharpen the „System-View" of the students.

Could combined use of these simulators improve the quality of decisions and shorten the time needed to decide? In this discourse the main point lies on the time aspect.

The "Time-Problem" in Normal Work and Learning Situations

The negative effect of time pressure is familiar to all of us. If we are forced to do more things in less time the effectiveness goes down and the faultiness goes up. So we have to correct more faults, this means less time, and so on. The causal loops of this system are shown in Figure 1. This structure is important to understand the problem of learning and decision making in normal working situations.

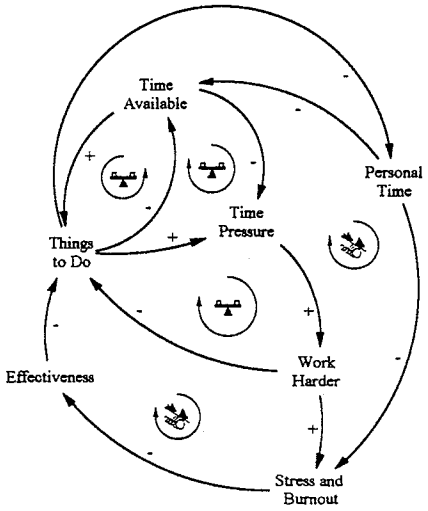

Figure 1: Effect of Time Pressure (Bellinger 1996)

The "Wheel of Learning" (Ross 1994/Figure 2a) is used to describe the process of (individual) learning. The most interesting parts of this wheel are reflecting, connecting and deciding. These sections are very time consuming; Ross et al wrote that the more time you use for reflecting, connecting and deciding the more you understand the problems you are faced with and the faster you learn. But time is a barely sufficient resource, so an "economic" use of this resource is the goal.

Simulation in Management and Management Education

Simulators based on computer models of the reality are often used tools to support learning. Especially the education of pilots would be more expensive and less efficient without flight simulators. Management and management education are rather more complicated than piloting an aircraft because management decisions are based on more and dynamic information and system structures. The principles of piloting are the same within most airplanes, organizations are originals. Simulator oriented education (for pilots) can be described as a more sublime form of conditioning. For example: If the red light on the left panel flashes you have to pull the orange marked handle on the front panel; if the plane stalls, do this or that ....

On the contrary, the student or manager should not learn to recognize several patterns of behavior, such as: Profits are declining so we have to cut our spending. Simulators in management and management education should be used as "learning-catalysts" (Milling 1995), for instance the users are able to:

- Reflect the actual situation (e.g. system) with an analyzing tool.
- Connect several ideas (e.g. structures/archetypes) with a sketching tool.
- Select the "best" solution (e.g. decision) with a decision support system (DSS).

So every part of the wheel of learning, except "Doing", can be seen as smaller and faster versions of this wheel. This structure is shown in Figure 2b.

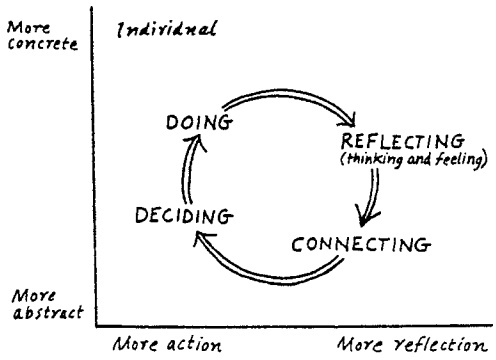

Figure 2a: Wheel of (individual) Learning

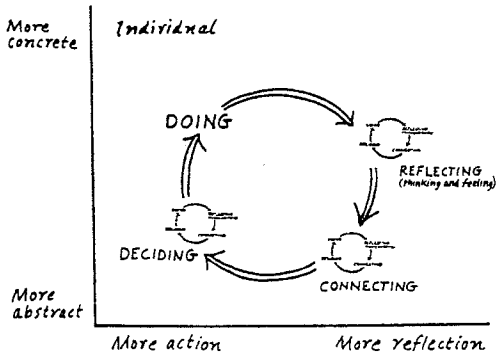

Figure 2b: Enhanced Wheel of Learning

The implementation of learning in the causal loops of the "Time Pressure Model" shown in Figure 3 follows the ideas of Ross at al (Ross 1994):

- More Time Available to Learn (ceteris paribus) equals Better Quality of Learning
- Better Quality of Learning (ceteris paribus) equals Higher Effectiveness (of Work)
- More Time Needed to Learn (ceteris paribus) equals Less Quality of Learning

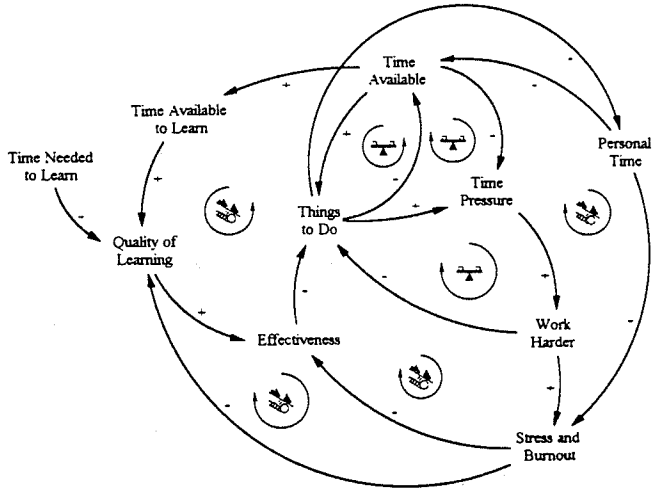

Figure 3: Learning and the Effect of Time Pressure

But where is the influence of simulation/simulators on this structure? There are two possible point of departure " Time Needed to Learn" and " Quality of Learning". As you can see in Figure 3, there are no polarities added to the arrows. The statement " Simulation enhances Learning" is often used, but (as far as I know) not proofed by empirical studies. In 1995 the Industrieseminar started a research on the effect of the use of simulators in a planning game. (Check: " Do Management-Simulators really enhance Decision Making?" by Frank H. Maier and Jürgen Strohhecker in this years proceedings)

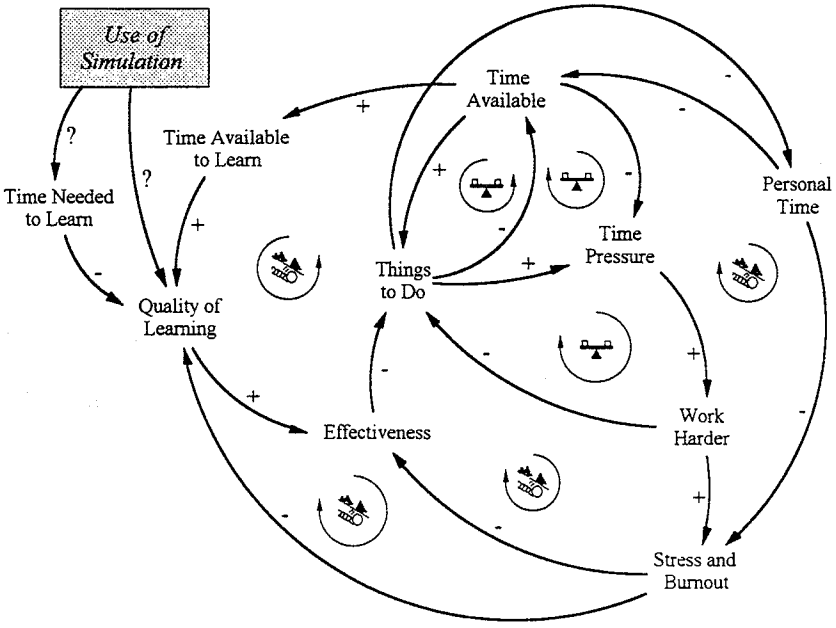

Figure 4: Structural Influence of Simulation on the Effect of Time Pressure

This is a *very* compressed version of the paper/discourse for the 1996 System Dynamics Conference in Cambridge/MA. The detailed version and complete references can be retrieved via the internet: http://iswww.bwl.uni-mannheim.de/pr/sd96/a_ukoe.htm

References (Short Version)

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