
Identifying Fruitful Combinations Between System Dynamics and Soft OR

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Summary. Since the 1960s qualitative problem structuring methods have evolved mainly in the UK from traditional operational research, which are called „soft OR“. These methods focus on generating understanding of systems as a whole, on improving systems, and on personal learning. System dynamics has similar goals; therefore, it might be useful to combine it with soft OR. Some examples of combinations exist; however, these are mainly anecdotal. Thus, systematic research promises new insights and knowledge about the useful combination of soft OR and system dynamics in practice and theory. This has often been asked for but has not yet been established. In this paper a characterization of system dynamics is presented that can be used to find potential combinations of system dynamics and soft OR. More precisely, a framework designed by [11] for mapping methods is described. This framework characterizes methods along two dimensions: four steps of intervention processes and three domains, in which problem situations manifest: social, personal, and material world. System dynamics is mapped and thus characterized by this framework. On the one hand, the mapping highlights the strengths of system dynamics; on the other hand, it shows possibilities for useful combinations with soft OR. With this study, further steps to a systematic research of combinations between system dynamics and soft OR are undertaken. Based on the method characterization of system dynamics and soft OR, proposals for concrete combinations can be derived and contextual factors for successful combinations can be investigated.

1 A Framework for Mapping System Dynamics and Soft OR

The term „soft OR“ describes a variety of methods, which help to structure complex and problematic situations [16]. Soft OR accepts subjective views of participants and deals with uncertainty and conflict between the stakeholders. It tries to resolve conflicting viewpoints among stakeholders and helps to achieve consensus about future action [16], [17]. However, with the focus on qualitative modeling, soft OR lacks quantitative techniques like simulation to

verify the subjective assumptions made in qualitative group discussions and to examine the time-dependent behavior of systems [3], [8].

In contrast to soft OR, it is one of the core elements of system dynamics to build a quantified simulation model from the description of the problem situation. Simulation runs with a model lead to understanding and improvement of the dynamic behavior of the system [21]. But, as [3, p.3] states, "little guidance exists for converting a real-life situation into a simulation model". With its focus on problem structuring, this is a strength of soft OR.

[8] as well as [13] describe combinations of soft OR and system dynamics and discuss the potential of the combination. They show that not only in modeling itself but also in other stages of a problem solving process, e.g. problem conceptualization or scenario analysis, the combined use of system dynamics and soft OR makes sense. As examples [8] mentions: strategic options development and analysis (SODA) giving rise to a system dynamics model [2], soft systems methodology (SSM) to negotiate the purpose of a system [9] or robustness analysis used to explore the scenarios and decision analysis to evaluate their desirability [4], [15].

Mostly, system dynamics is combined with SSM or cognitive mapping [13]. However, systematic research of possible combinations has often been asked for [8], [3], [11], [14], but has not yet been undertaken.

[11] proposes a framework for mapping methods with the aim of identifying suitable method combinations. The framework has two dimensions. The first one consists of four different stages of an intervention process: (1) appreciation of the problem situation, (2) analysis of the underlying structure and constraints generating the situation, (3) assessment of alternatives and finally, (4) action to bring about desirable changes. Of course, these stages are not seen as discrete sequential steps, but they represent different aspects that need to be considered throughout the process.

The second dimension represents the multi-dimensionality of problem situations. The fact that each problem has different aspects is represented by three "worlds": the material, personal, and social world. With this distinction Mingers refers to Habermas [5, 6]. The material world is the world which exists independently from human beings. The personal world is the world of the thoughts, emotions, experiences and beliefs of individuals. The social world is the world that individuals as members of particular social systems share. It results from interactions and relationships between human beings. Following this definition, the term social world represents in a general way social structures between individuals and is not limited, for instance, to activities in the social or health care sector. In the same way, institutions (like hospitals or schools) per se do not belong to the social world as defined by Mingers, they rather belong to the material world.

The framework can be used in two ways: On the one hand, relative strengths of a method compared with others can be highlighted. On the other hand, requirements on selecting methods for a concrete problem situation can be defined. As each method has different strengths and each problem has dif-