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USING VSM TO INTEGRATE SD MODELLING INTO AN ORGANISATION CONTEXT

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Working Paper 45/00
October 2000

Abstract

For some time, writers and practitioners, such as Vennix, Andersen and Richardson have addressed the problem of integrating the work of the system dynamics modellers into the decision making processes of an organisation. The method known as "group modelling techniques" has been widely discussed and used. This paper suggests that, in addition to a process which involves the facilitation of the modelling process with a group of internal organisational participants, it is necessary to provide a structure which integrates the outcomes of the group process into the broader organisational context. The model proposed here has been developed during consulting practice and uses Stafford Beer's Viable Systems Model as the basis for turning System Dynamics Modelling results into strategic intelligence.

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THE PROBLEM

A central concern for system dynamic modellers has been the extent to which the gap between the model and reality can be closed. On one hand, when the gap is large and the model simple, managers made doubt the model's credibility as an accurate reflection of reality and hence a good base for decision-making. On the other hand, large and complex models, where the gap is presumably smaller, are not only time-consuming and expensive to build, but may also appear to complex for managers to understand, with the consequent lack of credibility.

A number of techniques have been suggested to deal with this problem. Coyle (1999) has suggested that qualitative system dynamics is an appropriate methodology for building relatively simple models that have the advantage of incorporating feedback thinking into managerial decision-making. Vennix (1996), Andersen and Richardson (1997) and Morecroft and Sterman (1994) are amongst many writers who has suggested group modelling as the technique for eliciting information that will enhance the credibility of more complex simulation models.

Recently Vennix (1999) has discussed problems inherent in group decision-making processes that may mitigate against the accuracy of models developed in the group modelling process. All of the work in this area is indicative of two problems that system dynamics practitioners encounter when working with clients. The first problem is the limited ability of client groups to understand, or be able to devote enough time to understanding, the concept of feedback. Qualitative system dynamics appears to be the best working solution to this problem as causal loop diagrams are relatively easy yo explain to the uninitiated. The second problem arises from the quality of the information that is provided for the model builder. The eliciting this information is a subtle process and group modelling processes provide the best working solution to this problem.

There is another problem that needs to be addressed. Many modellers will have experienced the frustration of working closely with clients and developing models that are technically competent and reflect that needs articulated by the internal client group only to find that the model is not used in managerial decision-making. In some cases, this arises because the client group, to whom is delegated the responsibility of working with the modeller, is not the group or individual who would ultimately use the model in decision-making. There are a number of consequences of this division between model builders and end users.

The first consequence is one of timing. Model building is necessarily time-consuming, a situation which is often compound by the fact that the external modeller often has intermittent contact the internal modelling group. During the time when the model is being build, the decision major "loses contact" with the modelling group. Decision priorities can change during this period and once the model is completed, the decision-makers can have shifted their focus to a different problems. In this situation, the completed model has lost its immediacy and relevance. Clearly, one solution to this problem is keeping the decision major " in the loop" during the modelling process. This is highly desirable but often not possible when senior executive have limited time to be involved in the necessary detail of the modelling process. Nonetheless, this involvement may be central not only to the model building, but to the effective implementation and use of the model in decision-making processes.

The second consequences is related to the first in that it is concerned with the connection between the model building group and the decision maker. It has mainly to do with the relative knowledge of what system dynamics modelling involves and will ultimately deliver. It can often be the case that the keeper role is filled by someone who has a good working knowledge of system dynamics, both qualitative and quantitative. Such a person is often the initial sponsor of a system dynamics project inside an organisation.

This sponsor is the key link not only to the rest of the organisation but also to senior decision-makers for whom the model is being designed. The knowledge gap between the senior decision maker and the sponsor can be a factor contributing to the success of a system dynamics modelling project. For example, sponsor will often have a clear idea of the difference and relative contribution of qualitative and quantitative modelling. The senior executive may not share this understanding. The sponsor will also understand how the development of causal loop diagram is a useful first stage in working with a client modelling group in the development of stock-flow-rate diagrams and simulation models. For the senior decision maker, a good causal loop diagram with its associated feedback loops can often be a surprising revelation in to the systemic processes of the organisation and as such becomes a sufficient end to the modelling process. The danger is, that at this point, the modelling project can be seen as complete and the more complex process of building the simulation model is curtailed.

The consequence of this is that the simulation model and flight simulators are never used in the decision-making processes of the organisation. The benefit of the system dynamics intervention is limited to an understanding of feedback systems in causal loop diagrams. While this is a step forward for the organisation in many cases, it leaves it short-changed in terms of the benefits to be derived from the process.

This situation constitutes another problem for system dynamics interventions in organisations. It is not so much a problem of how the model is to be built but is a problem of how the model is to be translated into action in the organisation. This is a particularly pertinent problem when the decision-makers have not been part of the model building process. For system dynamics interventions to be successful in organisations, the modeller may need to consider not only the group processes by which the model is built, but also those processes whereby it is translated for wider context of organisational decision-making and action.

THE VIABLE SYSTEMS INTERVENTION MODEL

Stanford Beer's (1985) Viable Systems Model (VSM) can provide a useful framework for designing system dynamics interventions into organisations. Beer's model has the brain as its basic metaphor and comprises five systems.

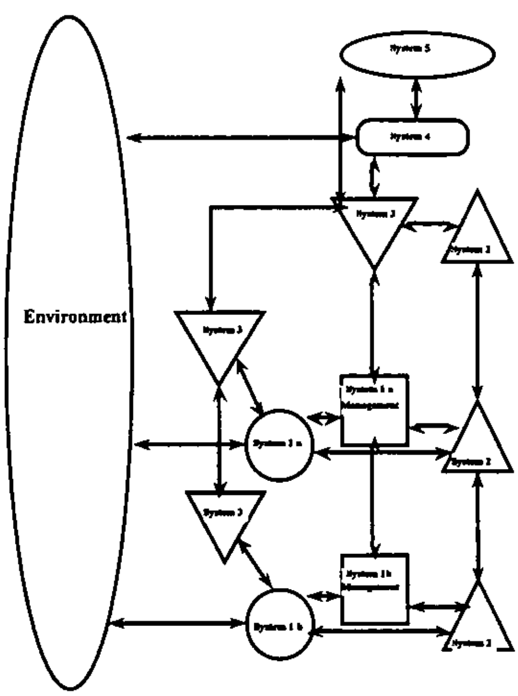

Figure 1: Stafford Beer's Viable Systems Model

Of particular interest here are System 1 which is the operating system, System 4 which is the intelligence gathering and distribution function and System 5 which is the policy development function. It is argued that these functions from Beers model are central to change implementation processes, the central concerned of modelling intervention. The other systems System 2 and System 3 are essentially concerned with coordination and control.

In a Viable Systems Intervention Model (VSIM), the modelling function would be undertaken by System 4, known in the VSIM as System M (Modelling). In the VSIM as in the VSM, the function of System M is to provide high-level information and strategic intelligence to System 5, known in the VSIM as System S (Strategy). While in Beers model, System 4 has responsibility for environmental scanning, in the VSIM, System M would also have the responsibility for scenario planning and organisational learning through the use of flight simulators.

The use of this model has the added advantage that it allows the modeller to "frame " a system dynamics intervention in terms of strategic intelligence and set the framework of expectations accordingly. It also serves to establish the need for a close relationship between System S, the policy function, System M the intelligence function.

In this framework, System S has a clear responsibility for the development of strategy. This strategy framework is important to provide the context for the work of the modellers in System M. It is also important that the process of model building and checking against the strategy is one of iteration and feedback between the two systems. The iteration and feedback process also enables System M to keep System S informed about the structure and dynamics of the model as it develops. A central difficulty that can arise to process is that the strategy makers "disconnect" from the modelling process and lose confidence that the model is meeting their strategy needs.

The other important element of the VSIM is Beer's System 1. This is the operating system, termed System O (Operations) where the technical experts, who often have deep insights into the function of the system, are working. It is often people from System O who are made available to the modeller to help in the development of the model. He relies the problem. For people with the intimate knowledge of the system are not concerned with developing policy. While the people who developed policy are not concerned with the intimate knowledge of the system. System dynamics modelling brings together these two elements in many organisations. In an organisation they often have little contact. For this reason, system dynamics interventions need to provide a structure which allows for information, knowledge and expertise to flow between these two groups. It is System M that must fulfil this function and the VSIM which provides a structure for doing it.

There is another important function of the VSIM which is not necessarily covered in Beer's original model. This is the function which develops the detailed policy options to be examined as scenarios by System S. It is designated System P (Policy). There may well be a number of subsets of this function developing different policy options. System P provides policy options to System S which in turn identifies those policies which the modelling group needs to simulate. It is important than a member of System M take part in the development of the policy in System P before it is sent on to System S. This participation involves the development of quantitative system dynamics models in conjunction with the development of the policies. The advantage of this is that knowledge and understanding of feedback systems is spread into the organisation and that the work of the policy developers is framed within a system dynamics context. This framing helps the development of the models in System M.

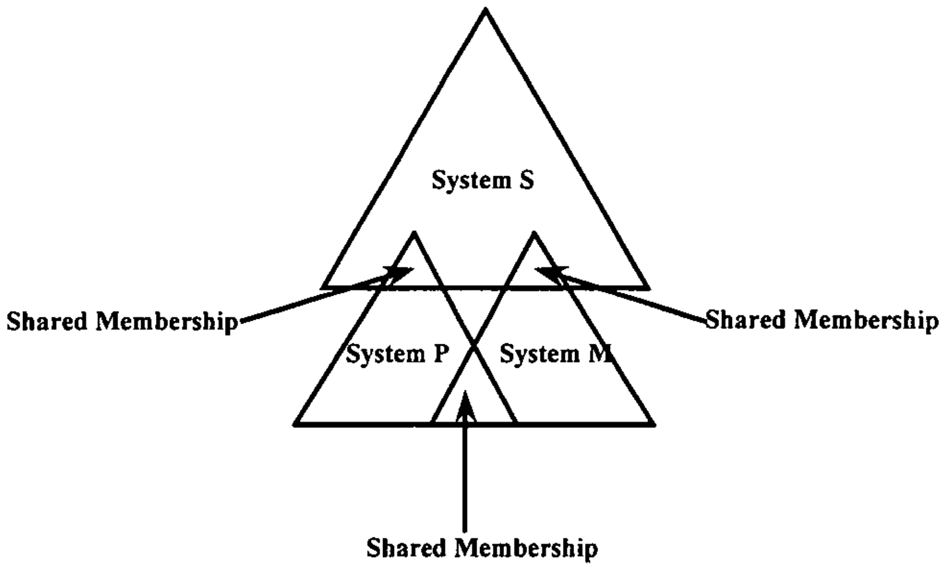

Figure 2: The VSIM

Ideally, these systems relate to each other through shared membership. A member of System S would act as the leader for each policy development group. A member of System M would also be involved these groups. And at least one member of System M should be a member of System S. This shared membership enables the flow not only of formal documentation and the sponsorship of the committee/sub-committee system, but also of the more subtle information of shaded meanings, sub-texts and political nuances which make up to life of all organisations.

The VSIM is characterised by two fundamental attributes. The first is a clear definition of the functional groups that a adjacent to the modelling process. The second is an overlapping membership between those groups which ensures continuity of information flow. It is these two attributes that are designed to provide an organisational context that will increase the chances of success of system dynamics interventions.

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