System Dynamics within consensus based decision making processes

Lorenzo Cioni

Department of Computer Science, University of Pisa

Largo B. Pontecorvo 3, 56127 Pisa, Italy

e-mail: lcioni@di.unipi.it

1 Introduction

The present paper contains some notes about the use of System Dynamics (SD) as a multi role tool within processes of consensus based decision making ([BR04] and [EHLS05]) applied to environmental problems and strategies.
Decision making processes are time consuming processes involving actors as decision makers, stakeholders and experts in a succession of phases ([PGSR99], [PGSR99]) that involve also feedback loops and whose aim is either the solution of environmental problems or the planning (and management) of environmental strategies.
Decision makers are those that have the responsibility of undertaking, implementing and managing the proposed solutions whereas **experts** provide for technical consultancy and expertise as a support for the definition of a problem and the design of potential solutions and **stakeholders**, since they bear the consequences of a problem and both the benefits and the consequences (as side effects) of the proposed solutions, can act as both opponents and supporters of these solutions.
From this perspective, the paper examines the use of SD ([vdB04]) as a tool for the building and fostering of environmental consensus so that the chosen solution or strategy is perceived as the best from all involved parties. In this way its implementation can occur more easily, without or with less obstructionisms and within the foreseen time bounds.
Within this framework, SD can therefore play the role of **analysis and clarification tool**, of a **knowledge sharing tool** and of a **scenarios planning**

and testing tool. In all these roles SD is a formalizing model that allows the definition of qualitative and quantitative relations for the description of models that represent, at variable levels of abstraction, the portion of reality under scrutiny.
In the first role SD can be used by actors so to deepen the knowledge of the problem and clarify and make explicit the hidden assumptions of the single actors.
In the second role SD allows the definition of a shared knowledge of a problem so that it is possible to attain a solution that is the best for all the actors. This allows the framing of a solution in a win-win context.
In the last role SD allows the evaluation of every tentative solution through the definition of possible scenarios (i. e. possible evolutions of a model depending on the proposed actions) so that actors can rate the possible consequences and benefits and accept a solution if it satisfy their expectations.

2 Scoping of SD

SD can intervene at different stages of the decision process and at different levels of involvement and understanding ([Wol90], [For99] and [vdB04]). A decision process is characterized ([vdB04]) by a timing dimension and by a degree of participation dimension. The **timing dimension** ranges from **early** to **late** so that the use of SD ranges from a framing tool to a decision communication tool: at the former extreme SD can fully play the aforesaid roles so to be used ([vdB04]) to scope the question and to build capacity and integration among the actors. At the latter extreme SD sees the aforesaid roles emptied of real significance so that SD is turned in a formal tool for the description of decisions taken elsewhere that can be only refined in small details.
Similar considerations hold also for the **degree of participation dimension** that ([vdB04]) ranges from **low** to **high** or from a low involvement in the building up of models (that is [almost] fully left in the hands of the experts) to a high involvement in such building up so that models can be seen as a joint effort of all the actors' activity.
This aspect is strongly interlinked with the issue of SD understanding since a common knowledge of SD tools is necessary to let decision makers and stakeholders profitably contribute with the experts to the modelling activity. This aspect is also a point of conflict between experts and mainly stakeholders that are usually judged not well trained for the use of formal methods such as those of SD. A possible solution ([KNP+00] and [EHLS05]) may reside in an early involvement of stakeholders combined with a high degree of

participation.

3 SD and consensus

Consensus characterizes processes through which conflicting interests and perspectives find an equilibrium point where all the actors see their expectations satisfied at the best.
The search of a consensus among the actors must be seen as the search not of a solution that satisfies a minimal set of requirements but a constructive process of composition of opposing requirements so that actors can be satisfied (or at least declare that can live with) the devised solution. The attainment of the widest possible consensus among the actors is a time consuming activity that is usually in conflict with more or less tight time constraints. Within this framework SD can prove a valuable tool since it allows the keeping of the design process on a concrete and formalized ground. In this way time wasting and self-serving objections can be rejected more easily so to keep the actors decision process on the track and within the usually exogenously fixed time constraints.

4 Applications

After having covered the theoretical aspects of these issues the paper faces their practical aspects. To examine such practical aspects of the proposed method in the concluding sections of the paper some applications to the decision processes for the localization of environmentally "controversial" plants (such as incinerators, electric power plants, solid waste disposal plants as well as big infrastructures such as highways, railway lines, airports and the like) are briefly presented and discussed in some detail.

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