

Participatory policy modelling for operational policy stream: the stakeholders and public administration perspective

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Abstract

An introduction of the participatory element into the existing policy making scheme challenges the whole policy making practice, since unmanageable stakes have a risk to mask the proper distribution of interests and hide needs of the society. The particular interest of this research is to describe participatory modelling procedures and construct the model by means of system dynamics that capacitates an input of policy stakeholders via a rational balance of interest expression in policy making and policy administration streams. The primary intention is to use these modelling techniques for the description of participatory procedures and apply them to governance of wider public policy issues. The model primarily is targeted to introduce such mechanisms to the policy making process that enable control of the completeness of the stake representation and to balance the stake representation. Equally the model has to protect policy makers from narrow interest advocacy against the public interest.

Keywords: participatory policy modelling, research based evidence, system dynamics, public administration, stakeholders.

Introduction

An introduction of the participatory element into the existing policy making scheme challenges the whole policy making practice, since unmanageable stakes have a risk to mask the proper distribution of interests and hide needs wider of the society. Accordingly, the permanent practical task for all policy making cycles is to decide what stakes could represent themselves as legitimate policy actors. This question goes in hand with the second question: how to engage those who have the stakes to participate in policy making processes and how to make a policy making process manageable in a transparent, equitable and rational manner.

Taken into account that the real policy formation process is more complex than linear and many parallel processes have direct or indirect impact on the final policy decision, the stream policy process model (as a combination of minimum three separate and compete streams of problems, solutions and actors) according to Kingdon (2003) is analysed to describe the route of decision

formulation. However even the stream model faces complications to describe the full policy design using any static models. As a consequence, the dynamic approach is of greater importance. The participatory system dynamic approaches could be integrated into the existing static policy design and elaborate more detailed constructions of interactions between stakeholder impacts on policy.

A particular interest of this research is to describe participatory modelling procedures and construct the model by means of system dynamics that capacitates policy stakeholders' input via a rational balance of the interest expression in policy making and policy administration streams. An involvement of a broad range of stakeholders is a costly and time consuming issue that could result in a no result zone and overload the decision making system with unmanageable stock and confronted stakes. The intention is to use these modelling techniques for the description of participatory procedures and apply them to governance of wider public policy issues.

The model primarily is targeted to introduce such mechanisms to the policy process that enable control of the completeness of the stake representation. On the other hand, the model needs to balance stake representation and let reduce the prominence of clear and powerful stakes instead of strengthening new and not conceptualised stakes (public interest mostly). Equally the model has to protect policy makers from narrow interest advocacy against public interest recognised as an equally treated stakeholder. The public interest as well as the evidence producers could be analysed separately from the whole list of stakeholders as additional stock.

Participation policy paradigm

In the context of increasing demands of public equality, multiplicity of interests and complexity of the problems modern society is facing, a single and although well informed actor cannot be considered as a proper decision maker. Furthermore, the classic institution of representative democracy with cooperation of hierarchical bureaucracy of the executive power in the chain of governing is neither a single nor the main actor any longer. Shifting the politics of representation to the practice of interactive policy making (Klijn, 2011) is being developed as superposition of confronting interests and higher uncertainty policy makers are faced. The previous distinction between policy making and policy implementation is not appreciating any more when the participatory policy paradigm is discussed.

The participatory policy recognises wider participation of policy actors (policy makers and policy administrators as state and local governments, non-governmental organisations, local communities, industries, businesses, scientists) in policy creation with demand for qualitative decision making (Ansell et al, 2008).

Participatory methods typically cover different ways of stakeholders' (considering public society or local community as a single stakeholder) empowering while policy regulation is planning and making decisions. Despite the fact that participatory public policy approaches are described normatively, and new understanding of governance such as meta-governance, network governance, interactive policy making (Klijn, 2011) are on the elaboration stage, the policy framework is still practising where elected politicians act outside policy networks and hierarchical bureaucracy seek manoeuvre in between legitimate policy framework and policy networks. Though clearly drawing the guidelines of the causes of such tensions (some stakes are representing themselves to politicians and others to public administrators), this understanding fails to solve practical operational issues how to align interest of policy actors and how to make policy making and policy administration efficient as an integrated framework. Therefore, additional efforts such as a participatory modelling could be needed.

Systems dynamics – participatory modelling.

System dynamics is an approach to design management solutions using computer simulation proposed by Forrester (1969). Despite the fact that system dynamics is widely used for management issues in different areas such as public health (Trochim, 2006), natural resources management (Mendoza and Prabhu, 2006; Dreyer, M. and Renn, 2011), IT addiction (Park et al, 2010), project management (Lyneisa et al. 2007), policing (Carter et al, 2011) with special attention paid to participatory components (Mendoza et al, 2006; Tako et al, 2010; Stave, 2010; Dreyer, 2011), scholars still report lack of studies concerning the public policy at public governance level (Ghaffarzadegan et al, 2011).

While discussing the participatory modelling, scholars have in mind both types of involvement: “active and direct involvement of stakeholders in model formulation and in the process of building the model itself“ (Mendoza et al, 2005) and stakeholders as only users of the model (Dreyer et al, 2011). Additionally, details concerning the policy design, the model components and their functionality could be more precisely determined during participatory policy modelling in cooperation with stakeholders (Bérard, 2010). As group model building, there are some components needs to be respected. It is participants and their interaction, modelling procedure, facilitating and sessions logistics (Andersen et al, 1997). Furthermore, models of participatory system dynamics introduce a complementary purpose to enhance the system and social learning (Vennix, 1999) and have added values for social capital development when the stakeholders are involved in the modelling process (Rouwette et al, 2002; Stave, 2010).

Since policy makers unsurprisingly generally express the lack of demand to use models for decision making as some scholars are reported (Webler et al, 2011), some rationality needs to be respected. Producing a usable model of participatory system dynamic, one should respect the main characteristics of public policy problems listed as follows (Ghaffarzadegan et al, 2011):

- Policy resistance. Its occurs when at later policy development stages the external environment influences the process (new policy actors coming, blocking the ideas, asking for feedback, delaying procedures and prolonging the time between policy action and policy outputs). This could be represented by feedback loops.
- The need for and cost of experimentation – since policy is not reversible, small scale experiments and adjustment of policy is appropriate to reach better outputs.
- The need to achieve consensus between stakeholders. Otherwise social pressure (e.g. lobbyists, citizens, political opponents) could damage the policy implementation stage and break the confidence of policy makers; as a consequence the long term goal loses the competition against short term goals.
- Overconfidence of policy actors (e.g. policy makers) and sensitiveness to reach the decision too quick.
- The need to have endogenous perspective as an organisational learning instrument as a safeguard against undesirable mistakes.

Application of system dynamics in policy design stages using stock and flow diagram helps to define decision rules “when new policy will become operational” (Wheat, 2010). Additionally the dynamic approach could help to understand the dynamic pattern of the policy process as an integrated system and to find weak points which could hamper manageable actions towards better and more coherent making of political decisions. The target is to find out the most crucial point of adjustment for the whole system to act automatically in the plausible way with sustainable feedback processes (Vennix, 1999). Moreover, such type of modelling could have more benefits than just direct instructions how to proceed, and enhance mutual stakeholder understanding and acknowledge as complementary effect of the model (Baldwin et al, 2004). The so called small systems dynamics models (Ghaffarzadegan et al, 2011), where just a few the most important stocks are connected by 7-8 loops, produce aggregated models and give a unique opportunity to describe the system in a simple and clear manner.

Methodology

Modelling of participatory system dynamics starts from scratching the preliminary model, which is further corrected according to the obstacles and wishes derived from individual interviews with the policy actors: policy administrators at the operational level of policy outlining and other policy actors who were intentionally invited into the policy process by policy makers. Those policy actors are considered to be stakeholders. The policy arena of the Ministry of Education and Science and the Ministry of Health of Lithuania has been chosen to reconstruct the policy streams in terms of stakeholder management.

The interviews were conducted in January-March, 2012. We interviewed 13 public administrators (7 – from Ministry of Education and Science and 6- from Ministry of Health) and 5 researchers who participated in different interest representation groups in 2010 when policy content was outlined. Policy actors were asked “to generate policy stories” (Andersen and Richardson, 1997) with the purpose to gain knowledge about policy processes and collect the attitudes of the public administrators towards stakeholders’ input. The interviews with respondents other than public administrators let us evaluate the intention of public administrators to employ stakeholders’ knowledge.

It is important that all selected variables had to be measurable in both qualitative and quantitative way, however the qualitative weighting is more applicable for the selected stocks. For that purpose expert based evaluation could be employed (e.g. a substantial number of experts could be interviewed and asked to rank the variables and assign the number they valued), however this issue is outside the scope of the present research.

Results: attitudes of public administrators and scientists towards the stakeholder input into policy

This section presents the key issues that were identified after the interviews. Based on these issues, the requirements for the participatory model were determined. For the interviews the following questions were used:

- How are stakeholders invited to participate in the policy making process?
- How do stakeholders engage into the policy formation?
- What is the input of stakeholders to the policy making process?
- What are the results public administrators pursue working together with stakeholders?
- What is the role of public administrators?

Arena for stakes representation: Stakeholders' input is recognised in the eyes of public administrators, although a feeling that institution of public administration are accepted more often as targeted stakeholders than any other part of stakeholders outside public authorities remained. Not surprisingly, almost every interviewee stressed that the stakeholder primary is sought for consultation purposes. Despite the fact that our interviewees confirmed the necessity of stakeholders' input into the policy making process, almost everybody pointed out that they see no differences between formal or informal engagement and interaction of any stakeholders whose competence the public administrator respects. Some of respondents stressed informal communication to a greater extent - face to face against formal transparent way of action. Meantime, there were felled plenty of ways how stakeholder could promote their interest other than mere communication with the public administration. For instance, direct application to the policy maker at the parliamentary level is widely used, mostly at the stage when consensus is achieved in the way to restrict initial set of interest. In such case some stakes gain more advantages.

Completeness of interests. The interviewees were very concerned about the completeness of stake representation in the policy making process. Meanwhile the invited participants are usually the same selected purposefully at one or another policy stage using an existing network of actors that have already participated in the policy process in the past.

Some stakes could be represented but public administrators complain that it is difficult take into account their interest and their support is weak. For instance, patient associations hardly ever appreciate research based evidence and feel lack of activity.

The role of public interest. Public interest is perceived as something very important and could be represented by the whole society or consumers, however interviewees stated that the society representation is weak and they raise their awareness of such representation from the media that is expensive and not very much rewarded way of engagement.

Research based knowledge. There is no doubt that research based knowledge is acknowledged in policy formulation. Interviewees call for "argumentation", "evidence", "expert knowledge", and "scientific proof". However critical attitudes towards using research based knowledge could be traced. Since the best policy actors are deemed only those who possess evidence of proof and could be perceived as qualified experts, any participation and mandate of stakeholders are left outside the focus. As a consequence, only knowledge sharing with various stakeholders is employed.

Requirements and constrains for participation modelling

The essential characteristics of any policy making models is to be simple (minimizing the variables and feedback loops) and easily readable in the terms of policy makers are accustomed. Therefore the small models of system dynamics are instrumental. Nevertheless a created model must be sufficiently rigorous (Mendoza et al, 2006) to produce hard evidence and stimulate application for the real policy changes. When proposing any new models, some requirements need to be respected and certain constraints followed.

Taken in to account the characteristic of the policy problems and the knowledge acquisition from the interviews, the model must meet the following requirements:

- to indicate a transparent, legal and manageable correct arena for stakes' expression – any stakes could be expressed via the same entrance to the policy arena and should be analysed using the same procedure.
- to control completeness of the stake representation during the policy process – the model should make sure that all possible stakes (supportive and confronting) are engaged;
- to seek balanced stake representation (to let decrease the expression of the clear and powerful stakes among emerging new and not yet conceptualised stakes (public interest mostly);
- to make clear emphasis on the public interest among other stakeholder interests;
- to highlight the research based evidence and underline the right manageable point to empower its impact;
- to evaluate the policy making practice in terms of participation quality. We discuss a participatory model that primarily helps to make a policy output and additionally could be valuable to evaluate policy results by means of qualitative interest representation.

Constraints could be analysed in the light of the model adoption process and accepted wider than a stimulus to minimize resistance to the new way of action rather than requirements. Since the main constraint for the model could be drawn as an objective to protect policy makers from a narrow interest advocacy against the public interest, it could safeguard policy makers from illegal pressing on one well expressed stake and restrict the policy stream to ignore other interests even unintentionally.

Conceptual model for participatory policy

Policy actors. The five independent variables representing policy actors were distinguished. Defining the groups of policy actors, the differentiation among certain stakeholders was made

concerning the targeted interests. Policy makers and public administrators (two variables) were analysed as separate actors or legal representatives of state or local authorities. From the remaining essential set of stakeholders, research based evidence producers (one variable) are analysed as a separate interest group according to huge scholars' attention that is given to the science policy interface (Hirasuna et al. 2010) and supported by literature produced on the evidence based policy (Head, 2010). Therefore whereas from one perspective, research based evidence producers could be percept as equally treated stakeholders, from the other perspective they could be analysed as individual policy actors with the mission to inform policy makers that not just their own stake should be presented. Not disaffirmed the scientists' interest to policy process and outcomes, the research based evidence has the other very important meaning to the policy – it is safeguarding rationality and democratic decision making (Webler et al, 2011). And the last group that is worth having as a separate variable is the public interest the stake of which are usually less conceptualised and more complicated to define.

Feedback loops. The group interests have two ways to initiate new policy changes. One is a direct trigger of a policy maker. The group interest, if it is clear determined, has a direct impact on new policy initiatives via stakeholder's power of impact. The search for supporting research based knowledge could be loaded afterwards. Higher power on a stake increases policy makers' attention. However there is a threshold when policy makers' attention concerts to debates. The magnitude of interest can be measured in different ways: for instance the represented sector of profit gain, the number of members represented, activity level, the rate of investment in interest representation. The interest power is the ration of successful initiatives with the total number of initiatives in a certain policy domain. The reinforcing mechanism is generates when the new policy initiative determines the objection and critique from the side of either those, whose stakes has lower power of impact or stakes were ignored at some extent or newly conceptualised stakes (public interest in particular). New policy initiatives could seek for supporting research based evidences.

The other way to initiate policy changes are to promote research based evidence collection and do research communication using scientists as independent experts. Interest groups could seek research based evidence for their own benefits, but the success of this way strongly depends on the policy makers' sensitivity to evidence. The sensitivity to evidence increases together with certain amount of produced evidences.

Public interest as a single but very essential stakeholder could use the same way to make impacts on new policy initiatives as described using the path via interest power. However the fact that public interest could be used to hide a real group interest should be taken into consideration. Such cases are reported in the public media and noted to by health policy administrators, whereas

industry based group interests use the way of public interest representation to make their message known to policy makers without any open connections with real stakes.

To sum up, there are three complementary ways to inform policy makers about certain interests and all these ways are jointly used to stimulate attention of policy makers using different channels (media, public interest imitation, research orders and result communication).

Model representation. The dynamic model of participatory policy was created on the bases of coupling of different streams of:

- problems conceptualised at policy makers level,
- solutions at operational policy administration level,
- political environment and actors at stakeholder representation level.

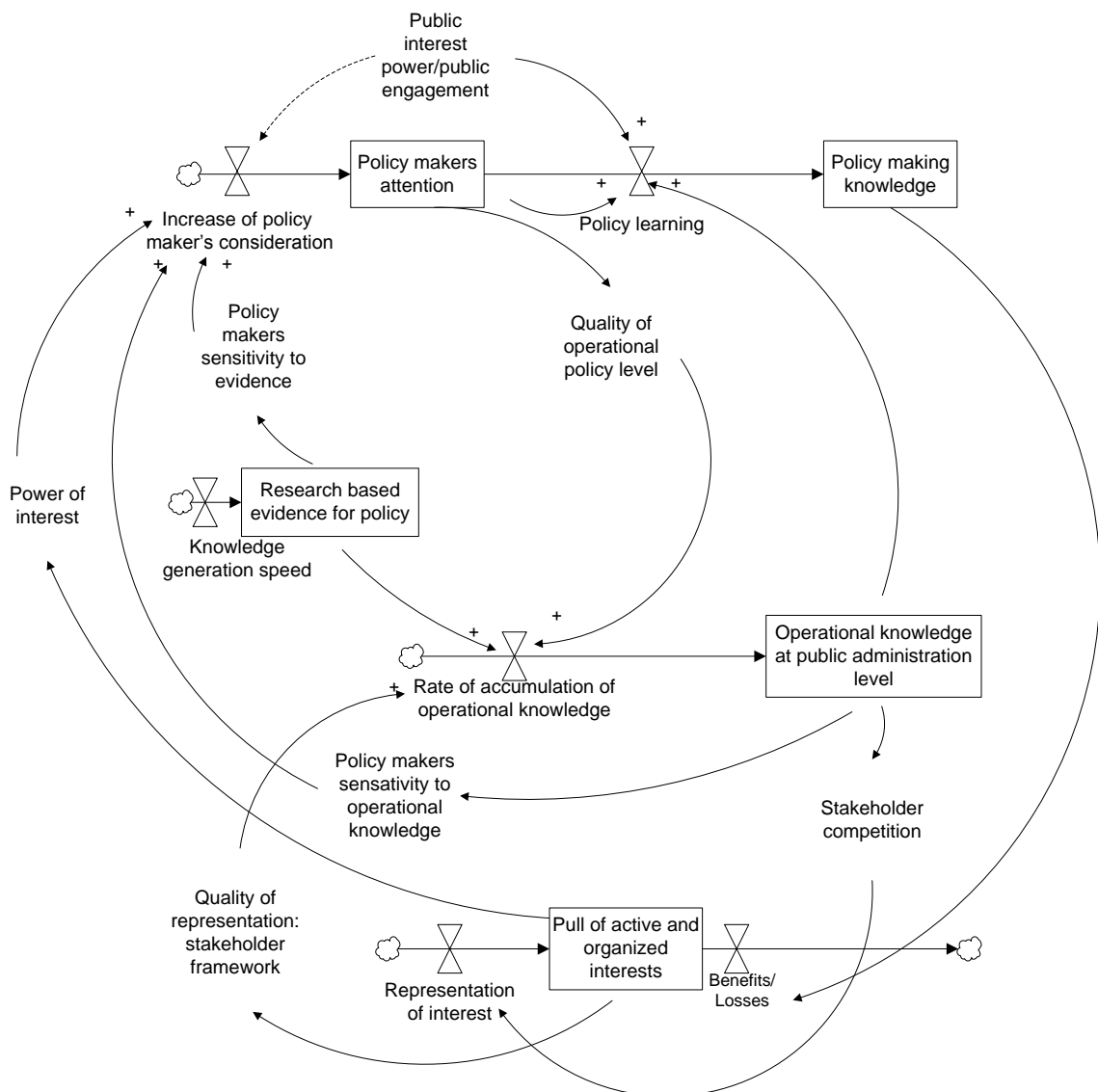


Figure 1. Stock and flow structure for the participatory policy model for balancing stakeholders input.

The conceptual model could be adapted to the policy process if stocks in dynamic model would be transferred to the policy process stages as other scholars are analysed (Tako et al, 2010). The proposed dynamic model has five stock variables, that correspond to policy makers (2 variables), public administrators, research based evidence providers and others stakeholders that act in an associated way. Figure 1 represents stock and flow structure for the participatory policy model of stakeholders' input balance. Every stock variable is in units of available knowledge.

The problem stream is engaged by the policy response at the moment when the knowledge capacity of the emerged issue reaches an obvious state and demonstrates a critical level. Indication of stock accumulation could be produced either by research based knowledge or individual interest emerging and directly expressed in the view towards policy makers. The effective political response to a stakeholder appeal strongly depends on the power of interests, while effectiveness of evidence depends on policy makers' sensitivity to the evidence. An input of public administration knowledge to policy making is a set of legal operational knowledge that could be the background for further debating. Available operational knowledge is considered as an independent variable and describes the organisational learning that appears every time when the policy cycle is finished.

The main constrain of safeguarding the policymakers from illegal pressing could be realised by introducing distinguished arenas' dedicated to two different purposes – interest expression and interest balance – with their alignment. At the flow of policy makers' consideration, all stakes with different origins have a chance to manifest; however the solution stream, where completeness of the interest is pursued, is launched after the stock of policy makers reach the level for debating.

When the problem stream is launched and policy makers are convinced to start debating, the process is delegated to the operational policy level to search for proper and acceptable solution in an alignment with existing interests.

The political environment stream uses a two stock structure that represents stakeholders, research based evidence producers and public interests.

Quality of operational policy level (coherency). Seeking to secure a policy outlining from the dangerous single stakeholder influence or the occasional narrow perspective of the issue the participatory policy approach could be applied at the operational level of the policy formation/solution searching stream. Participatory policy content fully depends on the quality of the operational policy level. The quality of that level depends on the following aspects: the ability timely recognise stakes and engage equal balance of stakeholder for solution searching, the competence to use research based evidence, self confidence and freedom for intermediate decision

policy makers confidence to use public administration sector as experts for policy operationalization.

Quality of representation: stakeholder framework stakes competition. Policy outlining at the solution stream proceeds via engaging those who have interest to represent their self's. The strategy firstly is based on awaking the competition of interest and leading the process to the stake alignment afterwards. The success of interest alignment depends on both the public administration ability to mediate and stakeholder representation ability. Talking about the stakeholder representation, we have in mind an organisation framework that lets stakes to develop in a democratic, open and systematic way of real interest representation instead of an incidental manner.

Research based evidence for policy. The aggregate amount of research that produces obvious evidence for policy could be generated equally outside solution stream and inside public administration institution. From the perspective of the participatory policy creation, R&D domain could produce evidence for policy making process and offer “access to more sustainable solutions” (Taylor et al, 2011). On the other hand that knowledge could be percept as the expert based advice for both policy makers and policy administrators and could be conceptualized as external knowledge about the issue. However the network like structure of the stakeholders where the actual policy details are elaborated and conceptualized force to search for more complex knowledge flow shaping new legislation creation and producing actionable evidence. The acceptance of research output that is generated intentionally with the purpose to inform policy makers strongly depends on interpretation and a possible impact on society. We can draw five main functions of the R&D input to policy solutions: to inform policy actors, to advice policy actors, to present the evidence, to keep process rational and to alert policy makers about possible impact of regulation.

Public interest power/public engagement. The role of society in public policy is highly valuable and sometimes is conceived as competition with research based knowledge and stakeholders interest. Although the society is perceived as a single stakeholder, it is rational to analyse its input into policy separately since the power of interest representation is substantially lower than that of others. Participation of the society on the participatory policy operationalization level is a very sensitive issue for policy administrators seeking both to enhance real engagement and to secure the process from an unmanageable flow of huge and diverse actors. Trying to avoid putting society representatives to an open competition with others stakes, the society could be granted a role as an external control and act with the policy makers at the problem and policy environment stream where policy draft prepared at solution stream is tested.

Conclusions

The focus of this paper is on the conceptual policy creation model based on the stakeholders' participation with the purpose to manage their influence via a study of system dynamics. Policy streams have been introduced for modelling of system dynamics. Small system models for participatory engagement can be helpful for modelling policy processes and balancing the confronted interests of different powers of interest. The stock and flow diagram based on interviews of policy actors was created seeking to make connections with different policy streams. An organisational framework flexible to react to the diverse stage of interest conceptualisation and their development during the policy creation cycle is proposed.

It is difficult to analytically test the model precisely since to measure the stakeholder power or knowledge needed for decision are rather a qualitative task than a quantitative one. These difficulties are magnified when the full set of stakeholder interests is simulated to power coefficient. A higher level of integration is a costly tool in terms of accuracy as the use of this model for sector interest integration produces rather substantial simulations. The results of this study is not targeted to predict exact policy output, but it provides a better understanding about interest representation and competition for an actionable policy making process (the model protect policy makers from narrow interest advocacy against public interest). Therefore, the model is mostly valuable managing knowledge needed for decision and defining the moment proper for regulation adoption.

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References

- Andersen, DF, Richardson, GP. 1997. Scripts for group model building. *Syst. Dyn. Rev.*, 13(2): 107–129.
- Andersen, DF, Richardson, GP, Vennix, JAM. 1997. Group model building: adding more science to the craft. *Syst. Dyn. Rev.*, 13: 187–201.
- Ansell C, Gash A. 2008. Collaborative Governance in Theory and Practice. *J Public Adm. Res. Theory* 18 (4): 543-571.
- Baldwin LP, Eldabi T, Paul RJ. 2004. Simulation in healthcare management: a soft approach (MAPIU). *Simulation Modelling Practice and Theory* 12(7-8): 541- 557.

- Bérard, C. 2010. Group Model Building Using System Dynamics: An Analysis of Methodological Frameworks. *The Electronic Journal of Business Research Methods* 8(1): 35 – 46.
- Carter D, Moizer JD. 2011. Simulating the impact of policy on patrol policing: introducing the emergency service incident model. *Syst. Dyn. Rev.*, 27: 331–357.
- Dreyer M, Renn O. 2011. Participatory Approaches to Modelling for Improved Learning and Decision-making in Natural Resource Governance: an Editorial. *Env. Pol. Gov.* 21: 379–385..
- Forrester JW. 1969. *Urban Dynamics*. Pegasus Communication, Waltham, MA.
- Ghaffarzadegan N, Lyneis J, Richardson GP. 2011. How small system dynamics models can help the public policy process. *Syst. Dyn. Rev.*, 27: 22–44.
- Lyneisa JM, and Fordb DN. 2007. System dynamics applied to Project management: a survey, assessment, and directions for future research. *Syst. Dyn. Rev.*, 23(2/3): 157–189.
- Head BW. 2010. Reconsidering evidence-based policy: Key issues and challenges. *Policy and Society* 29: 77-94.
- Hirasuna DP. Hansen SB. 2010. Is social science research useful to state legislators? *International regional science review*, 32 (4): 429-444.
- Kingdon J. 2003. *Agendas, Alternatives, and Public Policies*. Boston: Little Brown.
- Klijn EH. 2011. Democratic legitimacy criteria in interactive governance and their empirical application. In Torfing J, Triantafillou P. 2011. *Interactive policy making, metagovernance and democracy*, ECPR Press.
- Koppenjan J, Kars M, van der Voort H. 2011. Politicians as metagovernors – can metagovernance reconcile representative democracy and network reality? In Torfing J, Triantafillou P. 2011. *Interactive policy making, metagovernance and democracy*, ECPR Press.
- Lee D, Ahn, J. 2005. Rewarding knowledge sharing under measurement inaccuracy. *Knowledge Management Research & Practice* 3: 229-243.
- Mendoza G.A. Prabhu R. 2005. Combining participatory modelling and multi-criteria analysis for community-based forest management. *Forest Ecology and Management*. 207: 145-156.
- Mendoza GA, Prabhu R. 2006. Participatory modeling and analysis for sustainable forest management: overview of soft system dynamics models and applications. *Forest Policy and Economics* 9: 179-196.
- Park BW. Ahn JH. 2010. Policy analysis for online game addiction problems. *Syst. Dyn. Rev.*, 26: 117–138..
- Rouwette, EAJA, Vennix, JAM, van Mullekom, T. 2002. Group model building effectiveness: a review of assessment studies. *Syst. Dyn. Rev.*, 18(1): 5-45.

- Stave KA. 2010. Participatory system dynamics modeling for sustainable environmental management: Observations from four cases. *Faculty Publications (SEPA)*. Paper 188.
- Tako A.A, Kotiadis K, Vasilakis C. 2010. A conceptual modelling framework for stakeholder participation in simulation studies. Proceedings of the 2010 Operational Research Society Simulation Conference (SW10), 23-24 March, Worcestershire, UK, 2010, 76-85, ISBN: 0 303440 46 6.
- Taylor TRB, Ford DN, Yvon-Lewis SA, Lindquist E. 2011. Science, engineering, and technology in the policy process for mitigating natural–societal risk. *Syst. Dyn. Rev.*, 27: 173–194.
- Trochim, WM, Derek, AC, Milstein, B, Gallagher, RS, Leischow, SJ. 2006. Practical challenges of system thinking and modeling in public health. *American Journal of Public Health*, 96(3): 538-546.
- Vennix, JAM. 1999. Group Model-Building: Tackling Messy Problems. *Syst. Dyn. Rev.*, 15(4): 379-401.
- Webler T, Tuler S, Dietz T. 2011. Modellers' and Outreach Professionals' Views on the Role of Models in Watershed Management. *Env. Pol. Gov.* 21: 472–486.
- Wheat ID. 2010. What can system dynamics learn from the public policy implementation literature? *Syst. Res.* 27: 425–442.