

Building Consensus in Strategic Decision-Making: Insights from the Process of Group Model-Building

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Abstract

System dynamics is increasingly employed as a method to foster team learning in strategic decision making groups. Although only a full blown computer simulation model can reveal the dynamics of the system, in group model building the client organization is frequently satisfied with the construction of a conceptual (qualitative) model. In this paper a case is described in which a qualitative system dynamics model was built to support strategic decision making in a Dutch government agency. Since people from different departments held strongly opposite viewpoints on the strategy, the agency had discussed its strategic problem for more than a year, but had obviously not been able to reach consensus. The group model-building process was successful in integrating opposite points of view, as well as in fostering consensus and creating commitment. Careful evaluation of the case shows that three factors might have been responsible for this: the role of systemic thinking, improvement of the quality of communication and finally the role of the facilitator.

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Introduction

System dynamics is increasingly employed as a method to foster team learning in strategic decision making groups. Although a number of system dynamicists have been experimenting for some time with various group model-building approaches, a standard method for working with client groups does not yet seem to have evolved (Richardson et al., 1989; Fey and Trimble, 1992; Morecroft and Sterman, 1992).

Simultaneously group model-building is claimed to produce a number of advantages for strategic decision making groups. First, it is said to increase team learning and a shared understanding of the problem the group faces (Senge, 1990; Lane, 1992; Morecroft and Sterman, 1992). Second, models are claimed to be excellent communication tools (Quade, 1982; Meadows and Robinson, 1985). They force people to accurately express their ideas and opinions and prevent group members to make contributions with a high degree of equivocality. Although equivocality may be useful in order to maintain the balance of the negotiated social order (Eden, 1992), it can also obstruct the decision making process and affect the quality of decision making (Leathers, 1972). The third advantage is that group model-building creates consensus. Research has demonstrated that premature consensus and concurrence seeking can have detrimental effects (Janis, 1972; Janis and Mann, 1977; Hirokawa, 1985; Hirokawa and Rost, 1992). However, consensus after careful consideration of the problem and the available alternatives is a very effective way to make decisions, since it generally entails commitment with the decision by the participants in the process (Schein, 1969).

However, little is known about a) whether these claims are valid, and, if they are, b) how group model-building accomplishes the above advantages. One way to increase our understanding of the group model-building process is to carefully describe and evaluate these projects. In this paper I will follow this approach. A case is presented in which (qualitative) system dynamics group model-building was applied to support a strategic decision making process in a Dutch government agency. The agency had discussed its strategic problem for more than a year, but had not been able to reach consensus. On the contrary. People from different departments held strongly opposite viewpoints, and these seemed to become more rigid as time passed. Group model-building aided to integrate these viewpoints and build consensus about the strategic decision. After the description of the case it will be evaluated by discussing the results of a questionnaire which was filled out by the participants at the end of the project.

Initial contacts with the client organization

During a demonstration session of group model-building in March 1992 for the Department of Transportation, Public Works and Water Management (DTPW) I was approached by two persons of the Directorate General of Shipping and Maritime Affairs (DGSM). They asked if I was interested in conducting a couple of model-building sessions for the Long Term Strategy Group of DGSM. I was told that the issue to be modeled was related to the Dutch-registered merchant fleet. For economy reasons more and more shipowners resorted to so-called 'flags of convenience'. As a result the number of merchant vessels flying the Dutch flag had been steadily decreasing over the last decades. The Long Term Strategy Group of DGSM (consisting of the various unit heads) had discussed this problem for some time but was not able to agree on how to solve it. Somehow my two spokespersons had the feeling that approaching this problem with the aid of system dynamics would help to make each person's mental model explicit, provide new insights and potentially generate new solutions. Since at that moment we had little time to discuss the matter further it was agreed to have another meeting a couple of weeks later. As a preparation they sent some relevant policy documents.

The problem of the Dutch-registered merchant fleet

From way back the Netherlands have been a major maritime nation and have always played an important role in the maritime transportation of goods all over the world. Since World War II, however, things have changed dramatically for traditional maritime nations. The capacity of the world merchant fleet has increased fourfold, while at the same time the U.S. and the European share in this fleet have gradually but persistently decreased. The Dutch share in the world fleet decreased from more than 4% to less than 1% in 1990. These dramatic changes have among others been caused by differences between countries with regard to wage costs, fiscal policies and safety requirements. For economy reasons many shipowners were compelled to resort to so-called 'flags of convenience' (e.g. Liberia and Panama).

In order to reverse this trend the Dutch government has financially supported the Dutch-registered merchant fleet since the beginning of the seventies. This financial aid program has, however, not been successful. In addition, by the end of the eighties, the government faced a large budget deficit. Hence, by the end of 1991 both the Secretary of Finance and the Secretary of DTPW seriously considered the idea to suspend financial aid to the Dutch-registered merchant fleet.

A number of people in DGSM regarded this as a premature decision. They considered it impossible that the government would be able to estimate its potential consequences without analyzing the problem more rigorously first. Having seen system dynamics group model-building in action my spokespersons felt that this might be accomplished by applying system dynamics to the problem.

The group model-building sessions

Since the secretary of DTPW had suggested to stop the financial aid program and a decision by the Lower and Upper Chamber was approaching, time was limited. As a result there was no time to conduct interviews nor to employ Delphi like procedures. Instead three sessions of three hours each were planned in April and May 1992. It was agreed that after three sessions we would evaluate whether to continue model-building or not. To speed up the model-building process the three sessions would be interspersed with workbooks.

The first session

After a short introduction to the topic of system dynamics and an illustration of a previous group model-building project, I started the group model-building process by introducing the problem of the declining size of the Dutch-registered merchant fleet. This immediately gave rise to a heated debate in which several persons indicated that this was only a minor problem and that instead the focus should be on more important problems related to the Dutch coast and the Dutch ports. Gradually it became clear to me that there were strong differences of opinion within the division about its preferred strategy.

In fact it was one group in particular, i.e. the Sea Fleet Policy Unit within DGSM, who was most worried about the 'decreasing fleet size problem'. This is understandable since this unit is largely responsible for the Dutch-registered merchant fleet. As early as the beginning of 1991 the unit had started to prepare a policy document aiming to find renewed governmental support for financial aid programs to protect the Dutch fleet.

Apart from the Dutch commercial fleet, DGSM is also responsible for two other strategic areas. The first is related to the Dutch ports (i.e. Rotterdam and Amsterdam) and involves such tasks as further innovation in the ports, maintaining safety, and gearing activities and transportation modalities to one another. The second area concerns the advancement of safe and swift shipping traffic at the North Sea. Some of the people involved in these two strategic areas had strong doubts about the viability of the Dutch commercial fleet. In their view the Dutch fleet was 'history' and the other two strategic issues would prove to be much more critical in a rapidly changing world, where rather than a large commercial fleet things like telematics, logistics and floor to floor management would become increasingly important. These people basically agreed with the secretary of DTPW and proposed to cease

interference with the Dutch fleet altogether in order to be able to more fully concentrate future activities of the agency on the other two strategic areas.

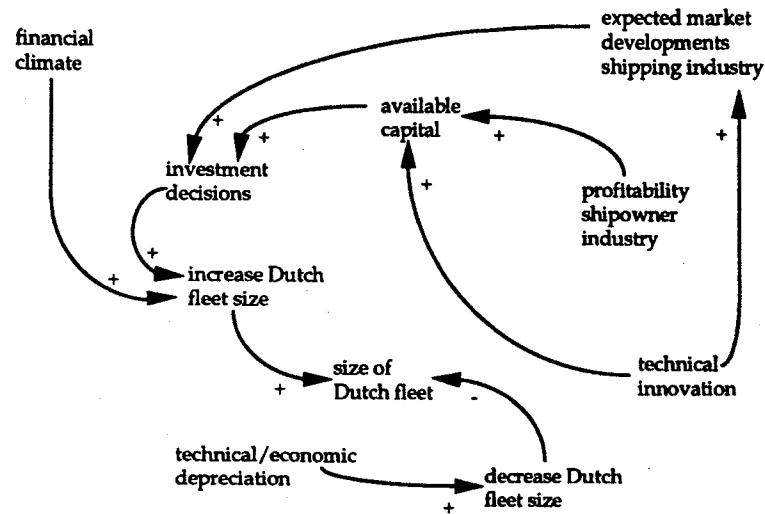
By the beginning of 1992 this discussion had lasted for more than a year and the Long Term Strategy Group obviously had not been able to reach a consensual decision. On the contrary it seemed that over time arguments and positions had become more rigid. This clearly surfaced during the first session when I introduced the problem to be modeled. Not only was there a heated debate about this issue, but some persons even refused to take the 'decreasing Dutch fleet' problem as a starting point for model-building. It looked as if the discussion would get stuck at the outset of the first session.

In order to overcome this deadlock I asked several group members why they considered the 'fleet problem' unimportant. Their answers suggested to me that they saw it as an isolated phenomenon, unrelated to other strategic problems. I suggested to the group that it would probably make little difference which subject would be taken as a starting point. From a system's point of view they would most probably prove to be interrelated and the other strategic areas would automatically come into focus during model construction. This (at least temporarily) convinced most of the sceptic group members and a deal was made that if 'their problems' would not surface within a couple of sessions we would rediscuss this issue. Hence we took the problem of the Dutch-registered merchant fleet as our preliminary starting point.

During this discussion I had also noted that group members held ideas and opinions which were rather rigid. The group obviously had a communication problem: people hardly listened to each other and there were many interruptions. In order to break through this ineffective communication pattern I employed elements from the Nominal Group Technique (Delbecq et al., 1975) to start the model-building process. The approach consists of the following steps.

After defining the initial problem, participants are invited to generate relevant variables in silence and write these down. Next the facilitator invites group members in a round robin fashion to name one variable from their list. Each variable is written on a hexagon (Hodgson, 1992) and put on a white board. When no more variables are generated by the group the facilitator starts building the causal diagram by selecting the problem variable (in our case the 'number of vessels flying the Dutch flag') and put it on a separate white board. Subsequently participants are asked to identify the causes for increases or decreases of this problem variable by looking at the list of generated variables. These are then transferred to the other white board and built into the diagram. In the following step the group is invited to consider the consequences of changes in the problem variable, again by looking at the list of variables. Simultaneously the facilitator encourages participants to look for connections between causes and consequences, thus identifying potential feedback loops.

As a consequence of the introduction and the discussion on which problem to model, actual model-building time in the first session was limited. The session ended with a causal diagram which only identified a number of causes of the decreasing number of ships flying the Dutch flag. It is shown in figure 1.

Figure 1: causal diagram after first session: causes of problem

This diagram was sent to the group members with a couple of accompanying questions in the form of a small workbook (cf. Akkermans et al., 1992; Vennix et al., 1990). Unfortunately in this case only two out of nine participants reacted to the questions. One of the potential reasons for this lack of cooperation was that persons tried to protect their positions by an attempt to postpone or prevent a strategic decision to be taken by the organization. Although the number of reactions was disappointing I proceeded as normal and added the changes made in the diagrams of the two workbooks to the causal diagram that resulted from the first session. This adapted diagram was taken as a starting point for the second session.

The second session

Another problem was that some persons were a little reluctant to participate in the sessions. They did not attend the second session but (at our specific request) sent substitutes. This on the one hand disturbed the process, but on the other it unexpectedly proved beneficial in the longer run because more persons from DGSM got involved in the strategic discussion often with new and fresh perspectives on the matter.

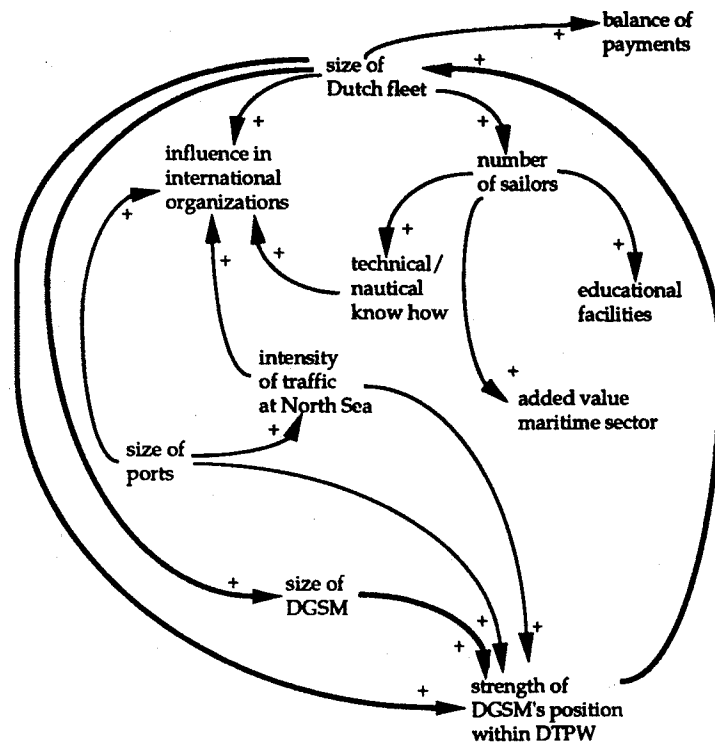
The second session was started with the adapted diagram from the first session, but one of the substitutes who was very knowledgeable about the process of investment by shipowners came up with a more detailed diagram of the investment decision process of shipowners. I invited him to present it to the group and after having discussed his diagram the discussion shifted to the question of the consequences of the decreasing size of the Dutch fleet. At this point the discussion waned. Obviously it is more difficult to generate consequences than causes of problems. In order to stimulate thinking about this issue I made the group conduct a 'mental sensitivity analysis' by asking the following question: "Suppose that the number of vessels flying the Dutch flag would gradually but within a few years decrease to zero. What do you think would happen?" This question really helped to produce interesting reactions. It was felt by the group that a distinction had to be made between the effects of no vessels flying the Dutch flag versus no vessels being managed in the Netherlands. In addition potential effects for DGSM were separated from those for the maritime policy area. A four cell matrix was applied in order to arrange potential consequences as can be seen in figure 2.

Figure 2: Potential effects of a decrease in the size of (1) a Dutch managed fleet, and (2) merchant fleet flying the Dutch flag for (a) DGSM and (b) the maritime policy area in general.

effects for decrease in size of	DGSM organization	Maritime policy area
Dutch managed fleet	<ul style="list-style-type: none"> - weaker position within DTPW - loss of technical/ nautical know-how - smaller organization 	<ul style="list-style-type: none"> - weaker international influence - decrease contribution to GNP
Fleet flying the Dutch flag	<ul style="list-style-type: none"> - smaller organization - loss of technical/nautical know-how - weaker position of DGSM within DTPW - less 'qualitative' departments - increase in attention to Dutch ports and Dutch coast 	<ul style="list-style-type: none"> - decrease contribution to GNP - weaker position in int. maritime organizations - increase in attention to Dutch ports and Dutch coast - loss of sailors (consequences for maritime education) - loss of technical/nautical know-how

For the causal diagram only the lower half of the matrix is important since it shows the potential effects of a sharp decline in the size of the Dutch fleet. Next we started including these potential effects (of the lower half of the matrix) into the diagram. Most of the discussion focussed on the effects on the position of DGSM within the DTPW. The group was convinced that a sharp decrease in the size of the Dutch-registered fleet would undermine the position of the division within the department of DTPW. In addition it would decrease the size of DGSM which would further reinforce this process. The weakened position of DGSM would in turn lead to a further decline of the number of ships flying the Dutch flag, because no other agency had the appropriate network nor experience to develop effective policies for the Dutch fleet. As a result of these discussions two feedback loops emerged in the diagram as can be seen in figure 3.

Figure 3: causal diagram after second session: consequences of problem



Due to the emergence of these feedback loops the first real doubts arose within the group about abandoning the support policy for the Dutch fleet, since in the long run this might undermine the strength of DGSM within DTPW as well as the influence in international organizations, which in turn might affect the potential to carry out the other two strategic tasks effectively. Although these thoughts did not yet neatly materialize in the above diagram it started to dawn in people's minds that the three strategic areas were more closely interrelated than they used to be inclined to believe. For those who were still in doubt this notion would be strongly reinforced in the third session by another feedback loop which was to emerge in the diagram.

The third session

One of the effects in the matrix which had not been discussed in the second session was the supposed increase in the effort of DGSM with regard to the Dutch coast and ports. The implicit assumption of persons opposed to continue support for vessels flying the Dutch flag had been that when this task would be dropped, DGSM's efforts could be more effectively concentrated on the other two strategic tasks. However, no consensus could be reached on plausible causal links to be put in the causal diagram to support this notion. Quite the contrary. The discussions and the emerging feedback loops were suggesting that the smaller the Dutch fleet the *more difficult it would be* to carry out the other strategic tasks. This conjecture which had already surfaced by the end of the second session was now strongly reinforced by a new feedback loop which emerged in the diagram.

Until 1992 support of the Dutch fleet had primarily been defended because of its contribution to the Dutch economy through ship building and repair yards, employment in the ports, training of crews etc. In the third session a new notion was added to this argument while discussing the role of the Netherlands in the whole logistical chain of storage, transshipment and distribution in Europe. Some

people argued that a strong reduction of the number of vessels flying the Dutch flag would in the long run lead to an outflow of a number of shipowners. Without Dutch shipowners the amount of maritime traffic through the Netherlands, and the size of the Dutch transportation sector, would also decline. As a consequence this would reduce the role of the Dutch transportation and distribution function in Europe. This in turn would impede the growth of the Dutch ports which would then further weaken the position of DGSM and thus lead to a further decrease in the number of ships flying the Dutch flag and a declining contribution to the Dutch GNP, as can be seen in figure 4.

Figure 4: causal diagram after third session

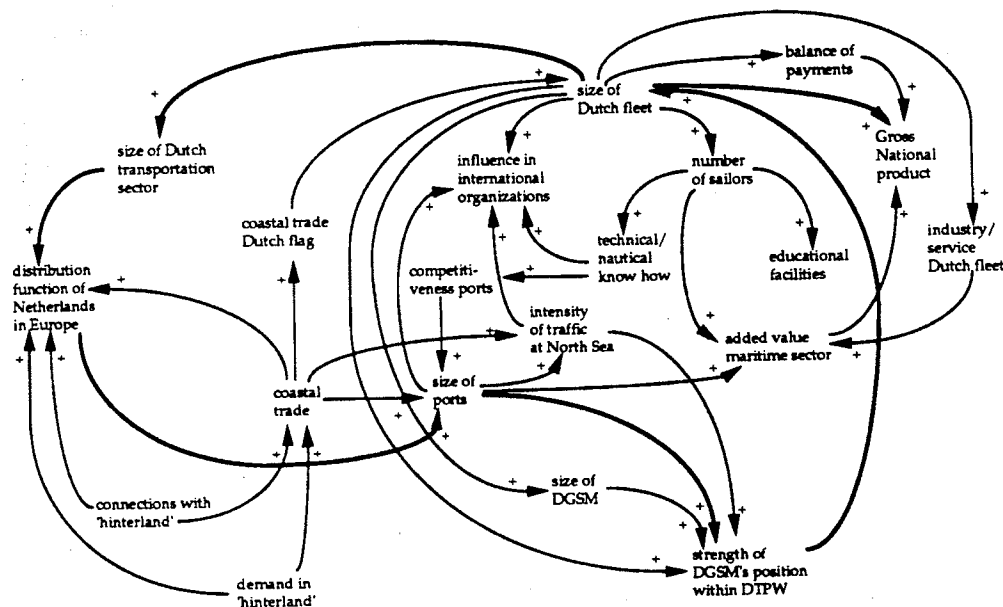


Figure 4 contains the final diagram of the potential consequences of a decreasing fleet size as it existed at the end of the third session. From a model builder's point of view the causal diagrams were not really finished. For instance there are several 'open loops', the submodels are not integrated into one overall model, and no attempt was made to quantify the model. However I had agreed that at the end of the third session we would evaluate whether to continue the model-building process. Although some persons agreed with me that the model was not finished, the majority of the group felt that no further sessions were required. This situation is not uncommon in group model-building (cf. Lane, 1992; Wolstenholme, 1992) and it indicates the usefulness of system dynamics as a qualitative method for system's analysis (cf. Wolstenholme, 1982; Wolstenholme and Coyle, 1983).

By the end of the third session three important conclusions stood out. The first was that abandoning support for the Dutch fleet would most probably affect DGSM's position within DTPW. Second, without a Dutch commercial fleet it would be hard for the Netherlands to maintain its role in international trade as a distributor of goods for Europe. Third, the indirect contribution of the Dutch fleet to the economy by enhancing the Dutch position as a distributor of goods to Europe was considered far more important (particularly in the future) than its direct contribution to the economy. These three insights altered several people's minds and helped to create consensus among the Long Term Strategic Group to try to find ways to continue governmental support for the Dutch fleet. In a sense the whole group was now ready to back up the policy document from the Sea Fleet Policy Unit, which this unit had initiated in the beginning of 1991.

The policy document

In parallel with the system dynamics sessions the Long Term Strategic Group was still discussing the structure and contents of the final version of the policy document which was to be presented to the Secretary to get support for the Dutch fleet. This policy document was published in September 1992, about 4 months after the last session (DGSM, 1992). Interestingly enough there is also a draft version of this policy document dating back to January 1991, more than one and a half year before. This document was produced by the Sea Fleet Policy Unit but was not supported by the whole DGSM organization as we have seen.

Comparing both policy documents leads to a couple of interesting findings and demonstrates the way the model-building sessions affected the strategic decision making process. As might be expected the contents of both policy documents largely overlap. However, there are also a couple of significant arguments in the final version which are missing in the draft version. These arguments can, at least in part, be traced back to the discussions in the group model-building sessions and the causal diagrams.

The first is related to the influence of the Netherlands in international maritime organizations. In discussing safety and environmental matters and the role of various international organizations the policy document emphasizes that: *"The strong international character of the maritime sector constrains the possibilities of self regulation by the industry. International organizations, like the International Maritime Organization (IMO) of the United Nations, are required to arrive at international agreements. The size of a national fleet determines to a large degree the influence a country can exert on decision making within these organizations."* (DGSM, 1992, p. 7).

The second is that the final version includes at least six references to the importance of the role of the Netherlands as a distribution country and its importance for the Dutch economy. It is also clearly argued that this function can only be maintained by means of a Dutch fleet. *"And in particular a modern, high quality Dutch fleet with the shipowner as logistic service agent is of great importance for the further reinforcement of the Dutch distribution function for Europe."* (DGSM, 1992, p. 9). And: *"For a number of flows of goods the shipowner is the director of the logistical chain (...). From their role als worldwide carriers they attempt to direct as many flows through the Netherlands as possible, because they also have financial interests in Dutch transshipment and distribution companies. This will strengthen the position of 'Netherlands distribution country' as gateway to Europe."* (DGSM, 1992, p. 10)

The importance of these arguments is reinforced by the fact that these are specifically mentioned by the Secretary in her accompanying letter of the policy document to the Lower Chamber: *"The Netherlands have always been an important maritime trading nation. Shipping is an essential link in 'Holland distribution country'. Strengthening this distribution function can best be accomplished if shipping activities are tied with the Netherlands. In order to accomplish this it is necessary to maintain ships flying the Dutch flag."*

Apparently the arguments produced in the policy document (combined with a lobby of a number of shipowners) had aided in convincing both the Secretary of Finance and DTPW to reconsider their original point of view of abandoning the financial aid program altogether. Obviously the arguments in the document were also convincing to the members of these two Chambers, because it was decided to agree with a financial support to the Dutch-registered merchant fleet amounting to about dfl. 150 million per year for a limited period of five years.

Contributions from the group model-building process

At the end of the process there were at least two tangible results. First, as participants indicated on a questionnaire, there was a high level of consensus and commitment with regard to the strategic choice. Something which was clearly lacking at the beginning of the process. Second, as a result of this DGSM accomplished to obtain a financial support of dfl. 150 million per year to protect the Dutch fleet.

The interesting question is to what degree and how system dynamics group model-building contributed to this succes. The answer to this question will be based on the participants' opinion about the process,

elicited by means of a questionnaire (Vennix et al., 1993), discussions with the gatekeeper and my own observations.

In my view three critical success factors of this group model-building project can be identified. The first is that the model-building process produced new and fresh insights in the strategic issues. Second, the process aided in improving the quality of communication within the group. Third, the process led to consensus about and commitment with the final decision. Let us look at each of these factors in more detail.

Creating new insights: the role of systemic thinking

Eight (out of nine) participants state that the process generated *new* insights into the problem and six state that the process changed their ideas and opinions about the problem. The question is what these new insights are? A skeptic might argue that it is hard to imagine that people would not have been aware of the importance of the Netherlands as a distribution country and the fact that shipowners play a role in this process. It would be difficult to deny this. What happened however is that the model-building process generated new insights because it restructured existing knowledge by putting it in a systemic perspective. Lack of systemic perspective was for instance demonstrated in the discussion in the first session on which problem to select for the model-building sessions. An indication of this can also be found in an answer from one participant to a question in one of the workbooks: "no, we know almost everything there is to know about this subject, but I have the feeling that we do not interrelate all that we know in an appropriate way".

The above speculation is confirmed by the results of the questionnaire. Most (seven or more) or all participants agreed that the model building process led to a more holistic approach to the problem, that it increased their insight in the problem, and that it revealed relationships between problem elements. In these answers the contribution of a systemic approach by means of system dynamics clearly surfaces.

Improving the quality of communication

Another important, maybe even critical, contribution of the group model-building process is the improvement of the quality of communication within the group. Prior to the group model-building sessions discussions in the Strategy Group were clearly characterized by ineffective communication. People in the Long Term Strategy Group hardly listened to one another, and made frequent interruptions. Empirical research has indicated that low quality communication negatively affects group performance (Gibb, 1960; Fouriez, Hutt and Guetzkow, 1950; Leathers, 1972). Hence, one of the first prerequisites to improve performance within the group was to enhance the quality of group communication.

Obviously group model-building was successful in accomplishing this. According to the participants the group model-building process aided to improve the communication in three respects. First, six out of nine group members agreed that it provided an equal opportunity for all group members to express their opinions. Second, six people agreed that group model-building aided to *explain* one's ideas to others in the group. Finally, seven participants agree (strongly) that model-building helped to better *understand* other people's ideas and opinions. They also agree that the causal diagrams were (very) helpful in this respect.

Creating consensus and commitment

The third important contribution of the group model-building sessions is that they fostered consensus and created commitment with the decision to attempt to obtain financial support for the Dutch-registered merchant fleet. Eight persons agreed that consensus was reached and that group model-building is an appropriate method to create commitment with the implementation of the plan. When it comes to commitment three persons agree and two strongly agree that they *fully* stick to the conclusions which were formulated. Two persons agree nor disagree and one person disagrees.

In part consensus and commitment was created through the systemic insights gained during the model-building process. The notion that abandoning the Dutch fleet might in the long run have serious repercussions for the whole DGSM organization must have helped to create this consensus. Commitment is also strongly affected by appropriate facilitation behavior (Vennix et al., 1993). Although several authors employ the concept of facilitator in relation to group model-building (Richardson et al., 1992; Lane, 1992) little has been said about what constitutes effective facilitation behaviour. In the remainder of this paper I will briefly discuss a couple of skills which were helpful in this case to produce consensus and commitment.

One important critical success factor in good facilitation is a problem oriented attitude. As far back as the seventies Roberts already indicated that for successful implementation of model results one should solve a client's problem (Roberts, 1978). The crucial idea is that a good facilitator wants to help a group solve a (strategic) problem *rather than build a model*. If the emphasis is on solving problems then model-building becomes a means to end (solving a problem) rather than an end in itself. In that sense the discussion about what problem to model is part of the process and part of the deliverable (Lane, 1992). As this case clearly demonstrates, an effective facilitator must be sensitive to, and work simultaneously at, various problems which impede group performance.

Another important skill which proved useful is to be neutral with regard to the content of the discussion. Getting involved in the content of the discussion generally weakens your position as facilitator (cf. Phillips and Phillips, 1993). More important than getting involved in the discussions is reflective listening: listening and trying to understand what someone means by what he or she says. Besides the fact that it helps to create commitment, it is also useful to prevent miscommunication in the group (Phillips and Phillips, 1993)

In addition, a facilitator must be able to increase the level of vigilance in the group by asking critical questions. Field and laboratory studies have shown the dangers of groupthink (Janis, 1972; Janis and Mann, 1977) and have demonstrated that vigilance in group decision making is more important than type of decision making sequence (Brilhart and Jochem, 1964; Bayless, 1967; Larson, 1969; Hirokawa, 1985; Hirokawa and Rost, 1992). One of the great advantages of model-building is that it almost automatically forces the group to think thoroughly about their problem and to challenge hidden assumptions. One clear example from this case is the assumption that abandoning the Dutch fleet would lead to more effort to be put in the other two strategic tasks of DGSM. Causal modeling helped to uncover and refute this tacit assumption.

Finally, it is important to conduct the model-building sessions in such a way that the model will be owned by the group. The best proof of this is when participants themselves step forward and start restructuring the model, as happened in this case. For a facilitator it is important to encourage this type of situation rather than trying to 'stay in control'. This might prove difficult sometimes, because this is one of the paradoxes of facilitation: by teaching the group how to help itself, the facilitator essentially eliminates his own role (Keltner, 1989). The facilitator should however keep in mind that he/she is in fact accomplishing what an effective facilitator should achieve: the group starts helping itself!

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