

Design Guidelines for Participative Business Modelling Projects: Lessons From An Unsuccessful Case Study

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Abstract

This paper describes the evaluation results from an unsuccessful case study. In this case study, system dynamics modelling was used to support the development of an implementation plan for a corporate strategy. Three modelling sessions were conducted with senior management, which were unsuccessful. A detailed analysis of the evaluation interviews with several of the participants has identified the main causes for this failure. These causes turn out to be threefold: Firstly, most of the participants were unwilling to discuss openly this politically sensitive issue, secondly several errors were made in project design and thirdly the scope of the strategic issue at stake was too broad to tackle effectively within the time frame allotted to the project.

Several important lessons are drawn from this project. These lessons are formulated as design guidelines for future system dynamics projects. Most of these design guidelines are not related to system dynamics modelling as such, but rather to underlying management consulting skills required to conduct any strategy support project with senior managers.

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Introduction

These are good times for system dynamics modellers in the business world. System dynamics modelling has become a very successful approach to support management teams of companies in tackling urgent and complex strategic business problems. An important explanation for this success may be that the system dynamics approach to real-world management problems has matured: An original core of system dynamics techniques has been combined with several useful techniques and insights from various backgrounds. Examples of such techniques are hexagon brainstorming (Hodgson 1992), workbooks and other Delphi-like knowledge elicitation procedures (Vennix et al. 1990, Vennix et al. 1992), simulation and gaming techniques (Sterman 1988, Byrne and Davis 1991) and organisation development insights (Senge 1990). The successful use of these techniques has been reported widely in the recent literature of the field (e.g. Morecroft and Sterman 1992).

Unfortunately, not everything is being reported in the literature. What the authors do describe is what models they developed, what techniques they used to develop these models and what the results were for the client organisation. But what is rarely being reported is *why* this particular combination of techniques was applied to this particular problem in this particular organisation. In short, the literature lacks *design guidelines* for system dynamics modelling projects.

Please note that the authors do not wish to suggest that the system dynamics community lacks design guidelines. For when asked personally, most experienced system dynamics modellers will produce a wide range of such guidelines, collected over the years in numerous modelling projects. But somehow, relatively few of these design guidelines end up in the literature (cf. Vennix et al 1992). This situation seriously limits overall progress of the field.

This paper describes results from a research project aimed at the development of such design guidelines. In the research project, an attempt is made to develop such guidelines for a particular version of system dynamics modelling for strategic decision making. This is the Participative Business Modelling method or PBM method (Akkermans 1993, Akkermans, Vennix and Rouwette 1993, Akkermans 1994). The PBM method is being developed, tested and evaluated in a series of six case studies. These case studies are studies of commercial modelling projects for a wide range of strategic issues, carried out by the first author in his capacity as a management consultant. This paper describes the results from the fourth case study in this project, which was carried out in the second half of 1993. This was a particularly unsuccessful case study, in a series of otherwise fairly successful up to very successful case studies. Conducting an unsuccessful project may, on the one hand, be a very frustrating experience for any consultant. However, it provides on the other hand an excellent learning opportunity. For when a professional finds out that a particular project design does not work for certain problems and certain groups, he may establish a "counter-indication" (van Aken 1994): He learns the limits of that particular design, i.e. he learns for what range of problems *not* to use this particular design. In the PBM research project, this learning opportunity is seized to the full. This paper presents the lessons learned from the evaluation analysis of this particular case study.

Research Method

Conceptual Research Model

The conceptual research model for the PBM research project is shown below:

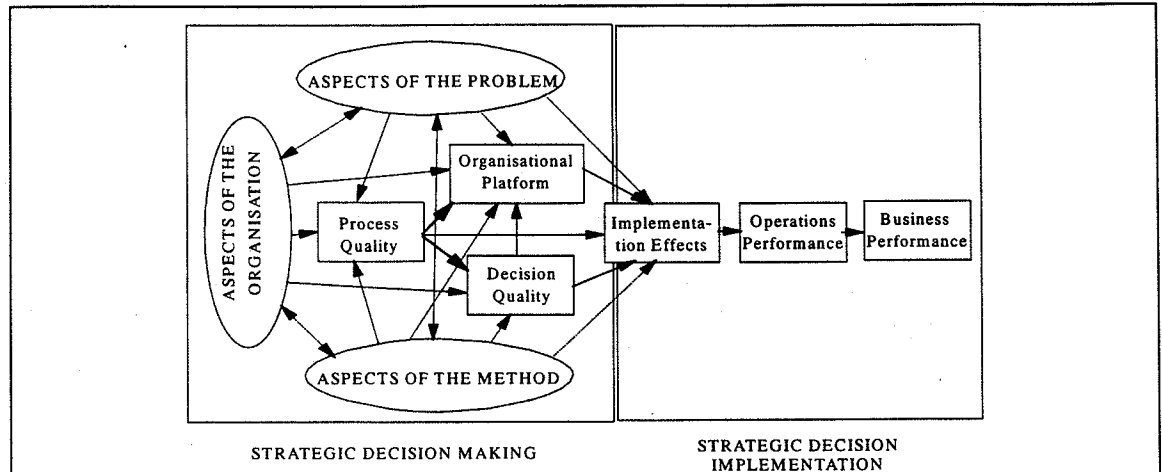


Figure 1: The Conceptual Research Model for the PBM Research Project

In the end, the objective of any method in this area is to improve *business performance* by improving *operations performance*. For this it is necessary that the strategy is well implemented. (*Implementation effects*). There are two conditions for successful implementation of any strategic decision:

1. A high-quality decision (*decision quality*)
2. Organisational support for the decision (*organisational platform*).

Given unlimited management time and patience, an organisation may always achieve this on its own. However, an added value of an outside consultant may be that the decision making process becomes more focused and fast (*process effectiveness*).

The actual "scores" on each of these four aspects depend strongly on various aspects of (1) the client organisation, (2) the problem itself and (3) the specific version of the PBM method applied. The PBM method focuses on the strategic decision making process; not on the implementation process following next. There, too many disturbing factors determine the actual implementation results of the strategic decision. Therefore, PBM effectiveness is measured primarily in terms of process effectiveness, decision quality and organisational platform.

Case Evaluation Method

The primary purpose of case evaluation analysis in the PBM research project is the distillation of design guidelines for PBM projects. These are guidelines in the format of: *In a situation where X and Y are the case, use technique T to achieve objective O*. A secondary, closely related purpose of case evaluation is to find refinements in the conceptual research model. Such refinements are causal relationships in the format of: *The higher X becomes, the lower Y will be*.

The basic material for this evaluation analysis is formed by (a) tape recordings of sessions and post-project evaluation interviews and (b) research memos written during and after the project by the consultant(s)/researcher(s). The first group of data provides the clients' perception, the second group provides the consultants' perception and interpretations.

This basic material is carefully analysed in a step-by-step data indentation and data refinement process. The first step consists of a scan of the session and interview tapes for references to the conceptual research model (e.g. references to communication during the sessions, or to consensus regarding the findings). The next steps gradually indent these references into ever more

aggregated data displays. The result is a causal network showing all the causal reasoning found in the case material for each of the overall measurement criteria for PBM effectiveness mentioned above. Figure 2 shows the causal network for the criterion "process effectiveness".

The final step in this evaluation analysis is the actual distillation of design guidelines and refinements in the conceptual model from these causal network. For this case the main design guidelines found are presented in the Discussion.

The Case Study

The Client Company and Its Strategic Issue

The client was a multinational company that had quite recently changed its corporate strategy. Like many other multinationals, it had decided that it wanted to operate towards its customers as a global provider of project services, rather than as a company providing services in several countries to local customers on a local basis. Regarding the main idea behind this change of strategy, there appeared to be a fair amount of consensus at the senior management level. However, there also seemed to be much disagreement regarding the translation of this general strategy into actual changes into the organisational structure and procedures. What was still lacking was "an implementation plan" for the new strategy. This plan had to be developed by all the stakeholders involved, it was felt. But that appeared to be quite a task, considering the complexity of the issues at stake and the large number and diversity of the managers involved. The CEO of the company asked the authors to assist his senior management in the development of such an implementation plan, using system dynamics techniques. These system techniques would help management both in dealing with the complexity of the issues involved as well as in dealing with the complexity of having a large group of managers involved.

The Intended Results

The main *content*-related deliverable of the project was to be an implementation plan of the strategy. This would include (a) an analysis of present bottlenecks in the business system, (b) suggestions for solutions for these bottlenecks and (c) an action plan to implement these solutions. The main *process*-related deliverable was to be an organisational platform for the decision, i.e. consensus regarding the plan and commitment to implement it.

The Project Approach

The approach chosen by the project team was a participative modelling approach that had been applied successfully in a number of previous projects (Akkermans, Vennix and Rouwette 1993, Akkermans 1994). This approach started with an initial round of interviews with the main stakeholders, complemented with a written questionnaire. On the basis of the findings from these interviews, five workshops of two hours each were to be conducted with the stakeholders. The first three workshops would take one and a half day and would focus on identification and analysis of the current bottlenecks. The fourth and fifth workshop were to take place one week later and would focus on solutions for the bottlenecks and an action plan.

The Actual Results

The way in which the project turned out was rather different. The interviews and questionnaire went as planned. These indicated an impressive number of bottlenecks, many of them on the cultural/political level. The first three workshops that were to address these bottlenecks went very

bad: Little constructive discussion took place, the models the project team had hoped to construct with the group did not appear on the white board, communication was not focused and the third workshop ended in disorder. As a result, the two final workshops were cancelled. The project team did receive a new assignment from the CEO, which has to wrap-up all the insights and models developed by the team so far into a final report. This report was received well by the CEO and was said to summarise adequately the main issues at stake.

Case Evaluation

As indicated before, this project went very bad. This becomes apparent from the top level "display" (Miles and Huberman 1984) of the evaluation analysis in Table 1. In this table the scores of this particular case study are presented for the main indicators for PBM effectiveness .

PROCESS EFFECTIVENESS: --	DECISION QUALITY: -	ORGANISATIONAL PLATFORM: --	IMPLEMENTATION EFFECTS: -/+
focus: --	completeness: +/-	commitment: --	decision implementation: -/+
speed: -	thoroughness: -/+	consensus: -	operations performance: NA
involvement: +	theory-basedness: -/+	awareness: +	business performance: NA
communication: --	usability: --	ownership: --	insight: +
willingness to cooperate: --		confidence: -	organisational learning: +/-

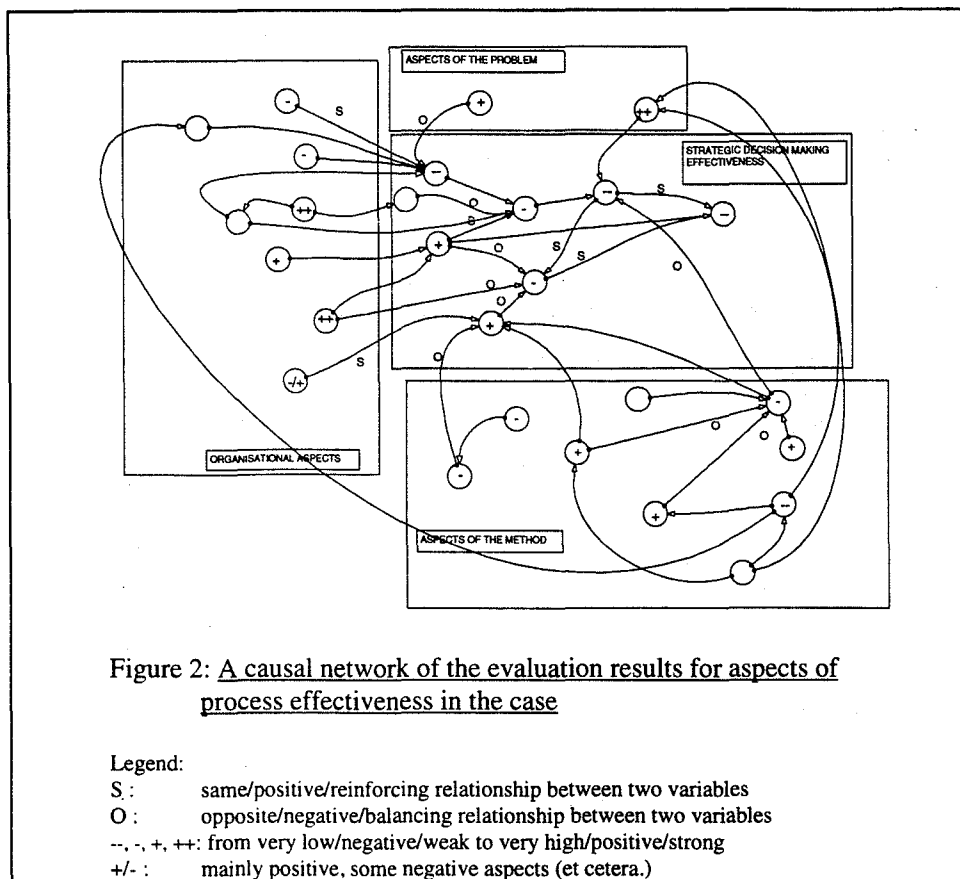
Table 1: Overall evaluation of project performance

What went wrong? The overall picture is as follows:

- *Process effectiveness*: was very low, (a) because numerous errors were made in project design; (b) because of the political sensitivity of the involved issues, which made most participants unwilling to discuss the issue at stake openly; (3) the problem scope, which was kept too broad to achieve adequate focus.
- *Decision quality* was also insufficient. Although most of the issues did come into the open at one time or another, insufficient analyses were made of these issues, due to low process effectiveness and the premature stop of the project.
- *Organisational platform* for the project findings was very low, which was not surprising, in view of (a) the frustrating process, (b) the insufficient analyses of the issue and (c) the fact that the final report was never sent to the participants.
- *Implementation success* of this project was therefore zero. In the months that followed several of the proposed changes were implemented, but these changes could not be attributed to the PBM project.

Evaluation of Process Effectiveness

The preceding analysis may give a general idea of what went wrong, but is too aggregated to distil any meaningful design rules from. To illustrate how these design rules are found, a more detailed picture of a crucial part of the evaluation analysis is shown in Figure 2. This figure shows the causal network (c.f. Miles and Huberman 1984) that was developed from the causal reasoning found in the case material that was related to various aspects of process effectiveness.



This causal network shows that process effectiveness in the three PBM sessions was something of a disaster. Why was that? The evaluation has shown three main explanations for this failure. The first explanation has to do with the composition of the group of participants, the second explanation has to do with project design, and the third with problem scope. Each explanation will be discussed in more detail.

Explanation 1: An unwilling group

Process effectiveness was low because most participants were unwilling to co-operate (5). This willingness to cooperate resulted in an awkward, stiff communication process (5→7). Awkward communication did not help in achieving focus (7→8); repeatedly, the discussion circled round the real issues, rather than identifying them directly. And focus is one of the main determining factors of process effectiveness: no focus means an ineffective decision making process (8→9).

But let us return to this very low willingness to cooperate. For this unwillingness several reasons were identified: The first reason was that there was no consensus on what the sessions were to achieve (1→5). The project sponsor and the PBM consultants assumed that the strategy to be implemented was generally supported. However, in reality, this strategy still met with considerable resistance within the company. Also, several participants indicated that, in their perception, there was no culture of open communication in this particular group (7a→5). This was to a large degree due to the hierarchical differences in the group, consisting of top management on the one hand, and the management layer directly underneath on the other hand (6→7a). Hierarchical diversity also caused verbal dominance of top management during the sessions (6→7b). Furthermore, willingness to communicate openly was low because of the unexpected attendance at the sessions of the newly

appointed CEO (15→5), who had been with the company only just a few days and whose ideas regarding the present corporate strategy were not yet known.

Not only were these sessions, in a sense, discussions between bosses and their direct subordinates, but also was the discussion subject a very touchy one. The problem itself was fairly sensitive from a political point of view: it related to the personal functioning of the managers involved, and problems regarding that functioning. Because of this political sensitivity, willingness to cooperate in an open discussion of these issues was also very low (2→5).

In retrospect, it is obvious that most people really didn't want this project to happen in the first place. Problem ownership (4→5) was certainly not shared. In fact it may have been limited to the project sponsor himself and a few others. His support was strong, and it was this top management support which forced these unwilling managers to the table, thus ensuring involvement of all major stakeholders, at least involvement in the narrow sense of the word (10→11). Involvement in the broader sense, i.e. actively participating in the discussion, remained very low (represented in this model as an aspect of communication (7)). All main stakeholders were represented, but this also made the group size very large (9 managers). This group size did slow down the communication process (13→11).

Explanation 2: Bad project design

The second main explanation for low process effectiveness had to do with project design. Project design was strongly flawed in this project. Given the group composition, it would have been hard to achieve an effective decision making process within any project design, but in this case the numerous design flaws did make things considerably worse. The main overall design flaw was insufficient steering by the facilitators during the session, which resulted in low focus (18→8). This insufficient degree of steering had several causes.

First of all, the facilitators had a mixed relationship with the clients. There were multiple dependency relationships between facilitators and clients outside of this project. This gave the facilitators less authority over this group of seasoned senior managers and therefore complicated strong steering (20→18). Secondly, the consultants' goals were mixed (22→18). Originally, this project had been a test case for the project sponsor to evaluate the usefulness of the PBM method. So, if anything, this project had to be a showcase of PBM techniques. The method came first, the problem came second.

Thirdly, there had been very little pre-session co-ordination of the consultants with the project sponsor (23→18). During the initial round of interviews, the original problem definition was changed and broadened. These changes were not discussed with the project sponsor, so that his precise goals and expectations remained unknown as well. (The mentioned unexpected attendance of the new CEO to the sessions, who had been invited there by the project sponsor, might also have been either better prepared or prevented had there been closer co-ordination between consultants and project sponsor (23→15).)

Fourthly, the consultants were insensitive to political signals (25) from the interviewees during the pre-interviews indicating that this was indeed a highly sensitive issue, and that few people really wanted this project. Had they really realised the true size of the process challenge they were facing, project design would have been very different: To start with, the problem scope would have been made much narrower (25→3). Also, the emphasis on full client participation in the modelling process would have been weaker (25→19). And finally, co-ordination with the project sponsor to overcome these complications would have been much stronger (25→23).

The fifth flaw in project design was an all too strong emphasis on full client participation in the modelling process (19→18). At that time the consultants were convinced, as a result of the successes of the previous PBM projects, that it was best to start modelling with managers from scratch, and let causal diagrams and the like arise from the open discussion. But here there was no open discussion, the problems were huge and time was very limited. So, in retrospect, starting from an empty white board was a bad idea. It would have been better to present the modellers' own impressions openly and start a focused and more open discussion from there.

Not only did this lack of session steering lead to insufficient focus, it also led to some repetition (18→14): the group was forced to recreate, in a modelling format, many of the findings that had been described in the report on interview results already. This repetition was inevitable anyhow, because some of the participants already had had experience with a PBM project on a closely related issue. They truly felt they were doing things all over again (16→14). Some repetition might have been avoided by use of inter-session workbooks (21→14), but workbooks were impractical because of the very limited two-day time span (17→21) within which all three sessions had to be conducted. Anyway, repetition slowed down speed (14→12).

Explanation 3: Too many issues in too little time

The third main explanation for the very low process effectiveness was related to the strategic issue itself. The problem scope (3) in this project was very broad. Too broad, one might say. The scope of the original problem definition had been broad, but during the pre-interviews important new aspects and viewpoints were added. Not surprising, since "implementing a global strategy" is bound to be a very broad issue. What should have happened, is that the consultants discussed this broadening with the project sponsor (23→3), and jointly decide to either increase the time available or limit the scope of the problem considerably. This discussion did not take place. Because of this very broad problem scope, focus was bound to be low (3→8).

Discussion

One learns most from one's mistakes. What then are the lessons that can be learned from this particular case study¹? Several of these lessons are discussed in this section. All these lessons are presented as design guidelines.

1. *Compared to other systems-based strategy support methods, PBM is most effective/least suited for situations where (a) modelling the issue involves limited/very high career risks for the managers involved and (b) there is no very little initial consensus regarding the issue.*

This is an overall-design guideline for the PBM method as a whole. This guideline may also serve as a reminder to system dynamics modellers that there are many methods to support strategic decision making, and that a considerable sub-set of these methods employ some kind of systems perspective. Within this sub-set, system dynamics has often been labelled as specifically suited for "unitary" groups (Flood and Jackson 1991, Lane 1993).

The message of this counter-indication for PBM should not be taken too absolute: in any group there are differences of opinion, and any strategic issue is politically sensitive to some degree. Rather, the message is that the lower pre-project consensus, and the higher political sensitivity of the issue, the more unwilling managers will be to communicate openly, and hence the more difficult it becomes to achieve true participation in the modelling process. So the message is not so much: "Stay off", but rather "Watch out" and set up your project design accordingly. This then leads us to the second design guideline:

2. *When you are modelling a politically sensitive issue, try to avoid getting too many bosses and subordinates around the same table.*

The higher the political sensitivity and the hierarchical heterogeneity of the group, the higher the career risk, and hence the lower the willingness to cooperate. Normally, one cannot limit the political sensitivity of an issue. What one can do is limit the number of boss-subordinate relationships in the group of participants. How does one do that? One way of doing that is via design guideline 3:

3. *Co-ordinate as closely and frequently as possible with your project sponsor or project leader to set up project design in a way that maximises changes of success.*

Frequent co-ordination and communication is a fundamental activity in any consulting assignment. It is also a fundamental activity in a system dynamics project. Together with your client you can (a)

¹These lessons are of course not truly based upon this single case study alone. *Implicitly*, the experiences in this case have been compared with experiences in the five other PBM cases. *Explicit* comparison of all these experiences will be performed in the cross-case analysis, which will take place after all individual cases have been analysed.

limit the scope of the issue, (b) decrease the number of participants, (c) increase the time available. In general: you can (and you have to) create all the necessary preconditions for success prior to the modelling sessions, rather than having to improvise on the spot.

4. *Try to limit the problem scope to a size that can be handled within the time available. If that is not possible, increase the time available. If that is not possible, try to structure the process as much as possible in advance.*

System dynamicists like to think that they are dealing with very complex and broad issues, and they are. Unfortunately, management teams are often faced with problem complexities and problem scopes far beyond what system dynamics can handle. Strategy design issues can be extremely "messy" (Ackoff 1981) or even "wicked" (Mason and Mitroff 1980). If you want to do a system dynamics project, you have to limit the problem scope to those issues that lend themselves well to eventual representation in a system dynamics diagram. If that is not what you want or what the client wants, then use a different method (c.f. Flood and Jackson 1991).

5. *Especially in risky projects, try to create sufficient time between sessions. This to increase correction opportunities and opportunities for informal co-ordination with the client, and hence to reduce project risks.*

In most participative modelling projects, there is at least a one week time interval between one modelling session and the following (a notable exception is Richmond 1987). This, the authors feel, is as it should be. This time in between gives one the opportunity to do everything needed to make the next session a success.

6. *In sessions with relative low willingness to cooperate amongst participants, try to have a facilitator with good process intervention skills. This will improve the openness of discussion.*

As indicated before, the best thing to do is to have all the right conditions prior to a modelling session. So if one is faced with unwilling participants, try to make them willing before the modelling starts, not during the modelling process itself. If that is not possible (and often it is not, or at least not with all participants), it is very helpful to have a process coach with sufficient process intervention skills and experience in front of the group. Such skills will help in identifying flaws in the communication process as they occur, bring them into the open and hopefully correct them (cf. Richardson et al. 1992).

- 7a. *If session speed is of the essence, or session time available is very limited, create an initial model and present that in a vulnerable manner to the group. The trade-off is that doing so may decrease client ownership of the model.*

Most management teams do not have sufficient time available to engage in all the modelling required. In that case, the modelling workshops will have to be very structured. One effective way of structuring is to present a small initial model of the issue, which represents some of the main ideas the consultants have developed regarding the issue. Richardson et al. (1992) call this a "concept model". The risk one runs here is that of decreasing client ownership regarding the model. Therefore such "concept models" should always be presented in a vulnerable manner, not as absolute truths: "Here is a representation of our initial impressions, please feel absolutely free to criticise."

- 7b. *If client ownership is of the essence, try not to structure too much in advance in terms of modelling. This will create maximal opportunity for client participation in the modelling process, and hence will maximise client ownership of the model. The trade-off is that doing so will often decrease session progress.*

The opposite version of the previous design rule is that it is easiest to achieve full client ownership for a model if the client has actually been involved in most of the modelling process. If client ownership is the primary objective, and time available is sufficient, one should start with an empty white board (but only if these criteria are met!)

8. *If modelling speed is very important, try to keep the group size of session participants limited.*

From the two previous design guidelines we learned that the more you structure a session, the greater session speed becomes. However, one drawback of structured sessions is that often every participant

has to be given an opportunity to participate actively, especially in "nominal group"-like exercises (Vennix et al. 1990). In that case, it will be especially helpful if the group size is being kept to a small number. Also, smaller groups (2-4 people) will permit more informal discussions. (c.f. Vennix et al. 1992) Such informal discussions often proceed very speedily at any rate (not an observation based upon this particular case study).

Conclusion

In this project, little was wrong with the system dynamics models produced. But many things went wrong in project design. This may be a consolation for the system dynamics community, but it should also be a strong warning. If we are really serious about wanting to support real management teams in dealing with real-world strategy issues, then our training will have to contain a far greater emphasis on acquiring real management consulting skills. Most of the current system dynamics modellers have acquired such skills over the years, through trial and error. Future generations may not be so lucky. For continued system dynamics successes with senior management, appropriate consulting skills may well be at least as important as appropriate system dynamics modelling skills, and perhaps just as difficult to acquire...

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