

Client perceptions of reported outcomes of group model building in the New Zealand public sector

Rodney J. Scott

PhD student, School of Agriculture and Food Sciences
University of Queensland, Australia

Robert Y. Cavana

Reader in Business Analytics, Victoria Business School
Victoria University of Wellington, New Zealand

Donald Cameron

Senior Lecturer, School of Agriculture and Food Sciences
University of Queensland, Australia

Abstract

System dynamics modellers sometimes involve decision-makers in the modelling process, a method known as “group model building”. Group model building has been associated with a number of different outcomes, and it is not clear which of these outcomes are important to clients. The public sector is a significant audience for group model building interventions; this paper reports on what outcomes are most valued by potential clients in the New Zealand public sector.

Four government agencies identified the employees who were most likely to commission and conduct group decision processes. These individuals participated in detailed semi-structured interviews, and completed a written questionnaire, exploring the contexts in which group model building may be useful and the outcomes sought in each situation. The results suggest that, even within the public sector, there are a variety of different decision contexts for which different outcomes are most important. However, public servants generally appear to value trust and agreement over policy quality when conducting group-decision processes. Knowledge of the outcomes sought by potential clients helps guide the outcomes measured by researchers, and helps practitioners to tailor communication messages to clients.

Keywords

Group model building, group decision making, system dynamics, clients, outcomes, public sector

INTRODUCTION

Over almost 40 years, system dynamics practitioners have experimented with involving the client in the modelling process (Greenberger *et al.*, 1976). These methods are now known as “group model building” (Vennix, 1995, 1996). Group model building includes a range of approaches that can be broadly categorised on two axes: the level of participation (Kolfshoten and Rouwette, 2006), and the use of quantitative versus purely qualitative models (Coyle, 2000). In some group model building interventions, models are built by experts with some input from participants, using quantitative modelling from the outset (Kolfshoten and Rouwette, 2006). In others, the model is built in workshops with or by participants, using qualitative data. In this latter group, simulation occurs only at the end of the project (Kolfshoten and Rouwette, 2006) if at all (Cavana *et al.*, 2007).

Group model building practitioners and researchers (employing using a range of participative approaches) noticed that group model building resulted in changes in the behaviour of the individuals and groups that participated. There have now been over a hundred published studies reporting on the effectiveness of group model building (Rouwette *et al.*, 2002), which note a range of “outcomes”. In the group model building literature, an outcome is considered to be a “change in the beliefs, evaluations, intentions and behaviours of participants” (Rouwette *et al.*, 2009, p582).

Group model building interventions are typically conducted by expert practitioners on behalf of “clients” (Vennix *et al.*, 1993). While some studies refer to the client as the organisation or organisations that hired the group model building practitioner (Vennix, 1995; Rouwette, 2003; Thompsom, 2009), others refer to the individuals that make the decision to commission or purchase the practitioners services (Andersen *et al.* 1997; Eden *et al.*, 2004; Rouwette *et al.*, 2009; Rouwette 2011; Rouwette and Vennix 2011; Martinez-Moyano and Richardson, 2013). In the context of this study, clients are assumed to be the individuals who make purchasing decisions on the group process used. This has some similarities with the “gatekeeper” role described in other papers (Richardson and Andersen 1995; Luna-Reyes *et al.*, 2006; Rouwette *et al.*, 2011). This study also distinguishes between clients (who make purchasing decisions) and “participants” (who take part in the group process).

Several recent papers have explored the use of group model building in a New Zealand public service context (e.g. Cavana *et al.*, 2007, 2014; Scott, 2013; Scott *et al.*, 2013, 2014). These report 13 outcomes associated with group model building: insight, mental model change, enduring mental model change, mental model alignment, enduring mental model alignment, communication quality, consensus, commitment to conclusion, strategy implementation, power levelling, rating of workshop conclusions by non-participants, perceptions of workshop conclusions by non-participants, and process efficiency. It is not clear if these outcomes are typically important to clients, or of no consequence at all.

Group model building literature suggests that, depending on the situation, specific goals may be emphasised and others ignored (Zagonel *et al.*, 2004; Rouwette *et al.*, 2009), and implores researchers to be very clear about the goals of an intervention (Andersen *et al.*, 1997). However, in many studies it is not clear how the measured outcomes relate to the intended outcomes (Vennix *et al.*, 1993; Huz *et al.*, 1997;

Vennix and Rouwette, 2000; Dwyer and Stave, 2008; Eskinasi *et al.*, 2009; Rouwette *et al.*, 2011).

Related fields, such as “soft OR”, have featured reports on what their clients typically value, and suggest that understanding what outcomes clients value is a critical question for researchers and practitioners alike (Eden and Ackermann, 2004). These authors described their experiences of interacting with clients, and comment on what they believe clients value, but did not present any empirical research.

An alternate view is that understanding what clients want is part of the client engagement process – that each intervention should begin with a detailed and explicit discussion with the client on the purpose of the intervention (Martinez-Moyano and Richardson, 2013). While this a component of good practice, there are several advantages of knowing *a priori* the outcomes that clients in a particular situation are likely to value. First, this information is of interest to group model building researchers, in determining which outcomes warrant further attention and focus. Secondly, understanding the outcomes that are likely to be of interest helps practitioners to tailor their initial communication with prospective clients.

There has been an increasing trend within the public service in many countries for collaborative decision-making (Ansell and Cash, 2008). As a group-decision support system (Andersen *et al.*, 2007), group model building has previously been applied to many public policy settings (Mingers and White, 2010). This paper reports on research conducted with the New Zealand public servants who are seen by their organisations as most likely to commission and conduct group decision-making processes. Through the use of semi-structured interviews and a numerical scale questionnaire, they were asked which outcomes they consider important. Interviewees were asked to rate the importance of outcomes reported in group model building studies with New Zealand public servants, and also to suggest other outcomes that were important to them. The interviews discussed when and why group-decision processes would be used, and when different outcomes were important or unimportant.

The paper is split into four sections after this introduction. The first reviews the outcomes reported in the previous papers related to this topic. The second describes the research methods. The third section reports on the results of the interviews and questionnaire. And, finally, there is a discussion of what this means for group model building research and practice.

GROUP MODEL BUILDING OUTCOMES

Group model building describes a range of qualitative and quantitative system dynamics methods that involve the client in the modelling process. The recent New Zealand public service case studies cited in this paper all used only qualitative tools (Cavana *et al.*, 2007, 2014; Scott, 2013; Scott *et al.*, 2013, 2014), but similar results have been reported using quantitative methods (e.g. Vennix *et al.*, 1993; Huz *et al.*, 1999; Rouwette *et al.*, 2011; Van Nistelrooij *et al.*, 2012).

These case studies evaluated a number of public service group model building processes, using three evaluation tools: a survey tool (Scott *et al.*, 2014), a pre-

test/post-test/delayed-test questionnaire (Scott *et al.*, 2013), and semi structured interviews (Scott, 2013).

The survey was based on a popular tool used in several group model building studies (Vennix *et al.*, 1993; Vennix and Rouwette, 2000; Rouwette 2011), that was administered immediately after participation in a group model building workshop. This was used to confirm that participants felt that the process had contributed to increased communication quality, insights, consensus and commitment to conclusions. Strategy literature reports these outcomes as being predictive of effective strategy implementation (Skivington and Daft, 1991; Noble, 1999; Scott *et al.*, 2014). Participants also compared the process to a hypothetical “normal” meeting, and believed that group model building was comparatively more effective and more time-efficient (Scott *et al.*, 2014).

The survey also revealed that non-managers rated the presence of an independent facilitator as important to their experience of the workshop (Scott *et al.*, 2014). This was related to “power levelling” (van Nistelrooij *et al.*, 2012), where less-powerful members are less-disadvantaged in their contribution to discussion (in this study, positional rank was used as a proxy for power).

The pre-test/post-test/delayed-test questionnaire collected participants’ recommendations for actions to address the problem at hand (Scott *et al.*, 2013). This tool was administered immediately before, immediately after, and twelve months following participation in a group model building workshop. The results of this evaluation demonstrated that participants changed their mind during the workshop, and that these decision preferences persisted for at least twelve months. Because of its enduring nature, this difference was attributed to mental model change. This tool also demonstrated that participants’ views became more alike (Scott *et al.*, 2013). Mental model change that resulted in greater similarity between participants’ decision-preferences was described as mental model alignment.

Participants’ new decision-preferences were from two sources – some were persuaded by the views of other participants, and others developed new insights from their participation in the process. New insights from participating were more enduring than those developed through persuasion (Scott *et al.*, 2013).

Finally, individuals who did not participate in the workshop process did not prefer the decisions made in group model building workshops to other decision alternatives (Scott *et al.*, 2013).

Group model building outcomes are believed to occur at four levels: individual; group; organisation; and method (Rouwette *et al.*, 2002). The thirteen reported outcomes are mapped to these four outcome-levels below:

- individual: insight, commitment to conclusions, mental model change, enduring mental model change;
- group: mental model alignment, enduring mental model alignment, communication quality, consensus, persuasion, power levelling;
- organisation: rating of workshop conclusions by non-participants, strategy implementation;
- method: efficiency (Scott, 2013; Scott *et al.*, 2013, 2014).

In one of the case studies (Scott *et al.*, 2014), the client was asked to describe their desired outcomes for the group model building process. They indicated that they wanted to: create among employees a common understanding of their new organisational strategy; create agreed implementation actions for the strategy; and increase commitment to the strategy. The prevalence of these goals is unknown, both compared to other organisations, or even other problem settings (or timing) within the same organisation.

METHODS

This study is a mixed methods approach to evaluation research (Blaikie, 1993). Primarily qualitative methods were chosen to explore in depth the experiences and beliefs of the interviewees (Kvale and Brinkman, 2008), supplemented by a quantitative survey to improve the reliability of findings (Blaikie, 1993). The interviews included open questions where interviewees identified and discussed the outcomes that were important to them, as well as direct questions about the reported outcomes being investigated.

Outcomes investigated

The previous papers related to this topic reported on 13 outcomes. This study was completed before the publication of some of these prior papers, and not all of the ultimately reported outcomes were explored directly in the interviews or questionnaire. Of the 13 outcomes identified in the previous section, the interviews did not include any questions about “process efficiency”, but this outcome was mentioned unprompted by several interviewees. The written questionnaire omitted both “process efficiency” and “rating of workshop conclusions by non-participants”.

Interviews

Each research subject took part in a face-to-face interview following a semi-structured format (Kvale and Brinkman, 2008). Each interview consisted of three themes: the interviewee’s experiences with group-decision processes; the interviewee’s desired outcomes (and when these outcomes might be most applicable); and the interviewee’s opinions of the outcomes being investigated. Each of these themes is explored further below.

The interviewee was first asked to describe the context of problem-settings in which they have used group-decision processes. Follow-up questions further explored the tools or processes that were used. This theme was used: to establish the relevance of the interviewee as a person who regularly commissions or conducts group-decision processes; to investigate the kinds of problem settings encountered by public servants who use these processes; and to discover what tools were being employed. Anchoring the interview in discussions of actual experiences is thought to be more reliable method of eliciting preferences than discussing hypothetical situations (List and Gallet, 2001; Ajzen *et al.*, 2004; Murphy *et al.*, 2005; Harrison and Rutström, 2008).

The interviewee was then asked which outcomes were important in the experiences they had described. In each case, interviewees were asked why these outcomes were important, and were asked a follow-up question to determine if any other outcomes

were also important. This was used to validate later questions: in this theme, the interviewee did not know which outcomes interested the researcher, and so the opportunity for subject bias (Orne, 1962, where individuals report what they think researchers want to hear) was reduced. This was also used to identify outcomes other than those being investigated.

After the interviewee described which outcomes they believed were important, they were supplied with each of the 12 outcomes described above, and asked whether this outcome was important, when it might be important, and how successful their existing processes were in achieving this outcome. This theme was used to evaluate each of the reported outcomes in turn.

The interviews ranged in length between 30 minutes and 1 hour, and were recorded by an audio recorder.

Questionnaire

A written questionnaire was given to the research subjects at the conclusion of the interview. The questionnaire consisted of two parts: demographic questions, and questions on the importance of each of the reported outcomes of group model building. Both are included in full as the Appendix (or supplementary file).

The demographic questions concerned parameters described in Table 1. Previous research had revealed no difference in how participants experienced group model building based on age, gender and education, but it was unknown if different client demographics valued outcomes differently. Less powerful participants had previously rated the importance of an independent facilitator as more important to their experience of the process (Scott *et al.*, 2014); a question on organisational rank was included to determine if there was a relationship between client-rank and outcome preference.

The second part consisted of 7-point numerical scale questions (Cavana *et al.*, 2001). The research design was primarily qualitative, because the researcher wanted to understand the research subjects' experiences and beliefs. However, the interview questions have not been validated, and so mixed methods were used to improve the reliability of the findings (Blaikie, 1993).

Research subjects were asked to rate each outcome, by circling a number between 1 and 7, where 1 meant that the outcome was of no importance, and 7 meant that the outcome was very important. Eleven outcomes were listed separately. This provides a separate measure of the subjects' views on the different outcomes, similar to the qualitative answers in the third interview theme.

Interviewee Selection

The primary researcher approached a number of New Zealand government agencies that have responsibility for developing public policy. Of these, four responded: the Ministry for Business, Innovation and Employment; the Ministry for Primary Industries; the Ministry for the Environment; and the Department of Conservation.

As discussed below, the research involved a small number of research subjects. Consequently, it was important that the subjects chosen were those who were most likely to represent the views of potential public sector clients. Hence non-probability judgement sampling methods were chosen (Cavana *et al.*, 2001). A gatekeeper (senior executive) at each agency selected individuals in their organisation who they believed most-regularly commissioned or conducted group-decision processes, to aid work related to public policy. The researchers believed that the agencies themselves were best-placed to identify the most relevant subjects for the study.

Research using qualitative interviews ideally concludes when “data saturation” has been reached; the point in data collection when no new additional data are found that develop aspects of a conceptual category (Guest *et al.*, 2006). Conversely, experimental design frequently requires some estimate of the necessary sample size before the research has been conducted (Green and Thorogood, 2009). Francis *et al.* (2010) propose two steps for deciding data saturation: first, specify a minimum sample size (initial analysis sample); and second, specify how many additional interviews will be conducted without new ideas emerging (stopping criteria). The aims of the study, and characteristics of the group, influence the likely saturation point (Charmaz, 2006; Mason, 2010). Seven criteria have been proposed for determining an appropriate initial analysis sample size:

- the heterogeneity of the population
- the number of selection criteria
- the nesting of criteria
- groups of special interest that require intensive study
- multiple samples within one study
- types of data collection methods use
- the budget and resources available (Richie *et al.*, 2003)

This study involves a selected, relatively-homogenous group (public policy makers, managers, people who commission group-decision processes). There are no comparison groups, and the methods are primarily qualitative. These factors suggest a relatively small group is likely to be sufficient. Two comparable studies reported data saturation at 14 and 12 respectively (Francis *et al.*, 2010; Guest *et al.*, 2006).

There is no established theory on how to determine the number that should be used as stopping criteria, but three is commonly used (Francis *et al.*, 2010). On balance, an initial sample analysis of 12 and stopping criteria of three was selected as most appropriate. After 12 interviews, the final three revealed no significant, new, unique information (i.e. data saturation was achieved). Though a robust sample for detailed qualitative study, this is a small number on which to make meaningful conclusions on the quantitative survey data – this limitation is explored further in the Discussion section. Interviewee demographics are shown in Table 1.

Table 1: Interviewee demographics

Parameter	Value
Number of interviewees	12
Government agencies represented	4
<u>Age</u>	
Mean	44 years
Range	31-56 years
<u>Length of employment in public sector</u>	
Mean	6 years
Range	1-20 years
<u>Gender</u>	
Male	6
Female	6
<u>Organisational level</u>	
Director	2
Group manager	3
Team manager	1
Non-manager	6
<u>Highest qualification</u>	
Postgraduate	9
Undergraduate	3
Completed secondary	0

Analysis

The responses to the interview questions were transcribed, then subject to content analysis using manual coding (Cavana *et al.*, 2001). The eleven assessed outcomes were pre-determined as codes, as these were the main subjects of the study. Any additional outcomes mentioned by interviewees were also coded. Other codes were emergent (Holsti, 1969; Strauss and Corbin, 1990). The analysis was then constructed on the basis of the themes that emerged in the text, illustrated with verbatim responses where these were useful in explaining each theme.

The rated outcomes were compared using commonly used statistical methods. The 7-point numerical scales used in the questionnaire were assumed to represent interval data (Cavana *et al.*, 2001). A Kolmogorov-Smirnov test was used to confirm normal distribution, which allows the use of a Student's t-test to determine significance (Stephens, 1974). Results for each question were compared to a neutral response (a score of 4 on the 1-7 scale), and to the overall mean (a score of 5.3 on the 1-7 scale), using a two-tailed t-test (as results could vary in either direction – Stephens, 1974).

RESULTS

Each interviewee demonstrated broad experience in commissioning and/or conducting group-decision processes, and described multiple situations where group-decision processes had been used. This confirmed that the research subjects were well selected as potential clients or users of group model building methods.

The results come from interview and questionnaire responses, and describe the importance of different outcomes in different contexts. The results are presented in four parts: the contexts, the outcomes, context-specific outcomes, and a statistical analysis of the questionnaire results.

Decision contexts

Different outcomes were important in different context, but there was strong overlap between the decision contexts described by each interviewee, and the outcomes that were important in that decision context. These different contexts mostly fell into five categories: political decision processes, internal decision processes; interagency decision processes, government-stakeholder decision processes, and inter-stakeholder decision processes.

Political decision processes typically involved agencies supporting their Ministers in negotiation with their Cabinet colleagues, or with support parties. Though public servants supported these group-decision processes by providing information, it was rare that they had any influence over the decision-support process used. These are therefore less useful for analysis; as one interviewee noted “*We can’t control what they do.*”

Internal decision processes typically involved consensus decisions taken by peer groups within an agency. Where there was a disparity in hierarchy, decisions tended to be taken by higher-ranked employees. These involved decisions on a course of action within a policy programme, or prioritisation and resource allocation between policy programmes. These were typically convened by a member of that peer group, were either chaired by a group member or facilitated by an independent facilitator, and required consensus agreement prior to completion – “*We were going to be locked in a room until we got this sorted.*” The exception to this pattern (mentioned by two interviewees) was when a group process was convened by a higher-ranked employee, and the group’s task was to arrive at a consensus recommendation – “*(The Deputy-Secretary) expects that we can come up with something...without having to bang our heads together.*” In these situations, the group included people of different rank.

Interagency decision processes involved employees of different agencies attempting to reach consensus agreement on a course of action, or on a joint recommendation to Ministers. Again, these were either chaired from within the group, or involved an independent facilitator. Where Ministers had demanded a joint recommendation, processes were driven to a conclusion, and often involved participants making difficult compromises. In contrast, processes to agree on a joint course of action often included alternatives to negotiated agreement – agencies could continue to operate separately if a satisfactory negotiated agreement could not be found. Partial agreements or progress toward agreement were also considered acceptable outcomes “*Sometimes it is about moving towards consensus, rather than achieving it.*” Interagency decision processes were seen as becoming more popular, with the creation of several secretariat units just to support and facilitate these discussions.

Government-stakeholder decision processes involved public servants working with stakeholders to reach an agreement. Typically public servants would begin the process with a tentative proposal, which would serve as the basis for negotiation – “*You never*

turn up with a blank sheet.” Despite typically holding a monopoly or monopsony position, public servants were often disadvantaged by political or reputational drivers to achieve a negotiated agreement, else the initiative would be considered a failure “*There are usually win-wins, but they also know you’re not going to walk away.*” Alternately, where government was contributing funding to a negotiated agreement, it was stakeholders who had an incentive to reach agreement or walk away empty handed. One example was where government would fund the production of an educational programme, if stakeholders and government could agree to the content of that programme.

Inter-stakeholder decision processes involved public servants acting as convenors to facilitate agreement between other parties. The aim of these processes was to arrive at consensus agreements, such that government did not need to act as a referee between competing interests. These processes were seen as increasing in popularity as they helped government avoid making contentious decisions, and were believed by interviewees to lead to less discord between opposing parties.

The strong and consistent distinctions between the different group-decision types was not anticipated – it may have been more useful to ask interviewees to rank the importance of different outcomes in each of these categories, rather than overall. Where ratings of outcomes were linked to particular decision contexts, this is mentioned in the sections below.

Results for each outcome

The responses from each subject showed a high degree of consistency and overlap. Three different methods were used to determine which outcomes were most important: the second theme of the interviews, where interviewees were asked to describe the outcomes that had been important in past situations; the third theme of the interviews, where interviewees were asked about the importance of specified outcomes; and the written questionnaires, where respondents were asked to rate the importance of specified outcomes on a numerical scale. These three methods showed very strong agreement, with a few exceptions noted in relevant paragraphs below, where results relating to each outcome are discussed in turn.

Commitment to conclusions was the highest ranked outcome by the questionnaire responses. Interviewees distinguished between finding something acceptable for agreement in the meeting (consensus) and being committed to supporting and implementing those conclusions. This was more important when the goal was to affect change (interagency cooperation, joint action with stakeholders), than when an agreement marked the end of the process (providing advice to a Minister or senior manager). Three interviewees mentioned that they had previously relied on voting methods to reach an agreed conclusion, however there was concern that these methods may sometimes lead to low commitment (by those whose preferred conclusions were not selected).

Communication quality was also highly rated by the questionnaire and interview responses. Communication quality was seen as “*crucial*” and “*where it all starts.*” In particular, communication quality was seen as important when working with stakeholders who did not have a “*shared language*” (“*engineers and planners don’t*

even speak the same English.”). Communication quality was seen as a pre-requisite for “*shared understanding*” which was seen as the ultimate outcome by one interviewee.

Consensus was generally rated as important in the questionnaire and interview responses. In many cases, coming up with “*any agreement*” was seen as success. This was particularly the case in inter-stakeholder decision processes – public servants were keen that participants all agree, even if those same convenors did not see the detail of the agreement as ideal. Several responses laboured the distinction between an ideal solution and one that all participants found acceptable for agreement. Particularly in interagency processes, participants were seen as sophisticated negotiators who would trade off different benefits to reach an acceptable agreement (in the absence of viable alternatives to a negotiated agreement). Agreement was often achieved around non-preferred but acceptable options.

Mental model change was one of the lower-ranked outcomes from the questionnaire responses, but enduring mental model change was one of the highest ranked. Interview responses do not fully explain this difference. Mental model change was seen as a luxury by some interviewees – the goal was to reach an agreement, not have transformative experiences for the participants. Agreements were often seen as “*incremental*” – “*we’re not expecting big shifts in how people see the world*”. Occasionally there is a need for a “*step change*”, and in those instances a technique for supporting mental model change would be desirable, but this applied to a minority of circumstances.

Enduring mental model change was perhaps interpreted by some interviewees as enduring agreement with the workshop conclusions; interviewees noted common delays between group-decision processes and implementation, and were particularly concerned that participants would “*go feral*” or start “*throwing stones*” at the conclusions that they had previously agreed to – “*(somebody) effectively reneging would have been a disaster.*”

Mental model alignment was ranked moderately highly by the questionnaire responses. However, interviewees often described concepts similar to mental model alignment as their most sought-after outcomes. This was particularly true when interviewees were asked what outcomes were important to them (without being prompted with possible outcomes). Interviewees described “*shared understanding*”, being “*able to understand where each other is coming from*”, and “*seeing things from their point of view*” as especially important. One interviewee recalled his previous experience as a negotiator: “*People who are on opposite sides of the table don’t have opposite perspectives, they have different ways of looking at the same problem*”...“*What seems a perfectly logical conclusion from your starting point, they may come to the opposite conclusion, not because they disagree with the logic but because they’re coming from a different place.*” Any tools or techniques that would allow participants to see the world in a more compatible way were seen as especially desirable. From these interview responses, it might be expected that mental model alignment would have been ranked more highly among the questionnaire responses. It is possible but unconfirmed that the language “*mental model alignment*” was unfamiliar to respondents, and that this led to lower rankings than expected.

Effective strategy implementation was an outcome that did not appear well understood by some interviewees, and it was difficult to relate some answers to the questions asked. Many group-decision processes did not involve strategy implementation and therefore were not applicable. Where this was seen as important, interviewees drew distinction between talk and action (“*If you don’t actually implement it, then what’s the point.*”) Applied business research struggles to evaluate system changes (Shadish *et al.*, 2001), and this is an ongoing research challenge for group model building.

Opportunities for persuasion were valued by some interviewees. Previous group model building research demonstrates that some learning occurs from other participants in the workshop, and some represents new ideas from the modelling process (Scott *et al.*, 2013). Interviewees were asked which of these was more important or should be more emphasised. Responses were mixed and closely followed interviewees attitudes toward the importance of insight in their processes. Those that valued new insights saw persuasion toward existing beliefs as a barrier to creation. In contrast, those that valued agreement by any means (regardless of the quality of that agreement) saw compelling persuasion as a useful means to speed the arrival of agreement. Previous studies considering persuasion did not propose how the amount of persuasion or new insight could be increased or decreased (Rouwette *et al.*, 2011; Scott *et al.*, 2013).

Power levelling was a concept that drew polarised responses in both the questionnaire and the interviews. Having less powerful members contribute was seen as useful in generating insight (“*If its about ideas, then you really do want to be in the situation where all participants have equal opportunity to contribute.*”), and in increasing a sense of “*engagement and ownership*” by those participants. Power-imbalances were sometimes seen as a strong barrier to participation – “*You can certainly see situations where relatively junior people are afraid to talk*” and “*you just get the loudest voices and the ones with the quickest tongues.*” Where interviewees used techniques to encourage contribution from everyone, they typically involved forcing participants to take turns in offering perspectives – interviewees talked about “*going around the room*” to elicit input individually, or using “*snowballing*” techniques to aggregate individual contributions (Thomas and Carswell, 2000). This is very different to the way group model building is thought to create power levelling, through allowing contribution and modification of the model through input from all participants (Van Nistelrooij *et al.*, 2012; Black and Andersen, 2012).

In contrast, power levelling was sometimes seen as counter-productive. Toward the end of the group-decision process, “*when it comes close to closing the deal*”, it was seen as sometimes beneficial for those “*who don’t have authority...to sit quietly and listen to those that do.*” Some interviewees thought it represented a more durable outcome where those that had more power were more able to influence the content of the agreement – “*power is power*”. Power levelling was overall rated as one of the less important outcomes of group-decision processes.

Insight was seen as useful “*at the beginning, to open things up*” or when “*prototyping*”. However, in some cases interviewees were more interested in coming up with “*any agreement*”, than whether this agreement contained any new ideas. One positive aspect of insight was that in interagency processes, new ideas were not seen as being owned by an individual agency, and so therefore were easier for other

agencies to agree with. Insight was seen as unhelpful when it complicated the parameters of the discussion and delayed progress to an agreement – “*you don't want new ideas when you've trying to nail something down.*” Overall, insight was not seen as very important in group-decision processes, and was the lowest ranked outcome among the questionnaire responses.

Views of non-participants were seen as sometimes very important (and sometimes not important). In many cases (particularly where the end goal of the processes was to reach an agreement), it was sufficient for only those present to agree, so long as those people had authority to do so (“*As long as you've got the right people in the room*”). However, in some cases described by interviewees, buy-in by broader constituencies was vital. Stakeholders were used as focus groups, with the assumption that if they agreed with a proposal it would likely be acceptable to other stakeholders with similar interests. Previous research found that conclusions developed through group model building were compelling to those present in the workshop, but not compelling to others (Scott *et al.*, 2013). Client acceptance of solutions developed through system dynamics modelling is a long-standing challenge (Greenberger *et al.*, 1976). Group model building aimed to overcome this challenge by involving clients in the modelling process (Vennix, 1996). Where participants have to relay findings to a broader constituency, or where participants are assumed to be representative of non-participants with similar interests, the problem of compelling communication of system dynamics conclusions is resurrected. Further research is needed to develop better ways of communicating conclusions from the application of system dynamics methods (Sterman, 2000).

Efficiency was seen as a key parameter (“*The biggest concern we have is time.*”), though participants were not specifically asked to rate its importance. Interviewees lamented that group-decision processes take considerably longer than decisions taken by individuals (“*If you were doing it by yourself, multiply the time by twenty and that's how long it takes with a group*”). Group model building participants have previously been asked to compare the speed of progress between a group model building workshop and a hypothetical “normal meeting” (Vennix *et al.*, 1993; Vennix and Rouwette, 2000; Scott *et al.*, 2014). In these studies, participants believed that group model building led to insight, consensus and commitment more quickly than a normal meeting. If speed and efficiency are very important to public servants in designing group-decision processes, greater care should be taken in evaluating the speed of group model building processes compared to other group-decision processes. *Further working together* was suggested by two interviewees as a key outcome of group-decision processes. In this way, participants create their own “*culture*”, “*cooperation is build incrementally*”, and future decisions have a foundation of mutual trust and “*goodwill*”. Previous research has evaluated further use of group model building tools by an organisation (Bentham and Visscher, 1994), but not the willingness of participants to continue to work together. The boundary object mechanism for understanding group model building outcomes (Black and Andersen, 2012) proposes a reinforcing loop where “*our progress fuels working together*”. Empirical evidence of this loop would reassure public servants that use of group model building can be part of a process to build ongoing collaborative relationships.

Willingness to endorse was mentioned by two interviewees. This related to the inclination to publically uphold the conclusions of the decision process, and referred

to situations where government was co-developing a product or programme in partnership with key stakeholders. The interviewees wanted endorsement from the group decision participants, to prevent later reputational risk to the credibility of the programme. One popular group model building research tool (the “CICC” questionnaire – Vennix *et al.*, 1993) includes a question on willingness to endorse: “I will uphold the conclusions/findings of these meetings in front of other members of my organisation.” (personal communication, Etienne Rouwette, 2011). If this outcome is important to some clients, it may be useful to report specifically on willingness to endorse in future research.

Several other outcomes were mentioned by one interviewee only. One described a desire for a technique to overcome participants’ attachment to individual words and to focus more on the content and meaning of the agreement – attachment to individual words was seen as a barrier and delay to reaching agreement. This cannot be directly related to reported outcomes of group model building. Modelling (as a visual language) may act to interrupt any fixation on textual editing. Conversely, the act of defining variables may provide a new opportunity for language preferences to form a barrier to agreement.

One interviewee described the need for participant disclosure – “*we want people to put their cards on the table.*” In the group model building process discussed in Scott *et al.* (2013), participants literally put their cards on the table – writing the variables they believed were important on post-it notes, and sharing those with the group. One group model building study investigates the extent to which unique information (information only known to one person) is communicated within the group, and the extent to which participants use information received (McCardle-Keurentjes *et al.*, 2008).

Another interviewee described the need for a shortcut to reaching agreement between several choices where none is obviously better. “*If you've got three (options) and none is patently better than the others, then pick one.*” This arbitrary decision-making was seen as sometimes stalling otherwise-successful projects when near completion. It is unclear how group model building could be useful at this stage – applying a system dynamics perspective at this time may challenge several underlying assumptions and re-open a process that was reaching its conclusion.

Finally, one interviewee believed that it was important to ensure that no important factors or risks had been omitted from discussion (“*How do you check you’ve got all the important stuff?*”) System dynamics practitioners may believe that their methods are more comprehensive or holistic; however this is difficult to measure empirically. There was limited focus on policy quality, except indirectly (as inferred through the interest in insight, power levelling, and completeness).

Outcomes in different contexts

Interviewees were asked to describe the kinds of group decisions that they commission and/or conduct. As described above, a careful reading of the transcripts identified 5 decision contexts, and 19 outcomes. The text was then re-analysed to relate each outcome discussed to one of these decision contexts. Interviewees often described outcomes as either very important or unimportant within a particular

decision context (see Table 2), and there was considerable variation between the contexts. As each interviewee described a range of examples, it is not possible to relate the contexts described in the interviews to the questionnaire findings.

Table 2: Important and unimportant outcomes for different group-decision contexts,

Decision context	Important outcomes (most important first)	Unimportant outcomes (most unimportant first)
Political decisions	----- <i>Out of scope</i> -----	
Internal decisions	Consensus, insight, commitment to conclusions, power levelling	None mentioned
Interagency decisions	Mental model alignment, further working together, consensus	Power levelling, insight
Government-stakeholder decisions	Efficiency, commitment to conclusions, enduring agreement, willingness to endorse, consensus	None mentioned
Inter-stakeholder decisions	Communication quality, enduring agreement, mental model alignment, efficiency	Insight, views of non-participants

Statistical analysis of questionnaire results

The written questionnaire was primarily used to verify the conclusions of the interviews, as explored in the discussion of each outcome above. However, a comparative analysis of the questionnaire results revealed some interesting findings.

All of the outcomes assessed were rated as equal or more important than the neutral response (a score of 4 on the 1-7 scale), and some significantly more important (Table 3). This suggests that all outcomes assessed were viewed as somewhat important, and several were viewed as very important. There was a wide range of responses – only “communication quality” and “commitment to conclusions” were always rated at 5 or higher.

Outcomes were then compared against each other. Some outcomes were viewed as more important than others. “Communication quality” and “commitment to conclusions” were both viewed as significantly more important than the other outcomes, and “insight” and “power levelling” were viewed as significantly less important. Significance was determined by comparing scores for that outcome with the overall mean score (see methodology).

Table 3: Ratings of the importance of each outcome, relative to a neutral and mean responses (n=12)

Outcome	Mean	Range	Standard deviation	Difference from neutral score (1)	Difference from overall mean (2)
Commitment to conclusions	6.3	5-7	0.78	+2.3**	+1.0**
Communication quality	6.0	5-7	0.74	+2.0**	+0.7**
Consensus	6.0	4-7	0.95	+2.0**	+0.7*
Enduring mental model change	6.0	4-7	1.04	+2.0**	+0.7*
Mental model alignment	5.8	4-7	1.03	+1.8**	+0.6
Effective strategy implementation	5.7	3-7	1.30	+1.7**	+0.4
Enduring alignment	5.3	4-7	0.98	+1.3**	+0.1
Mental model change	4.4	3-7	1.31	+0.4	-0.9*
Opportunities for persuasion	4.3	2-7	1.71	+0.3	-1.0*
Power levelling	4.2	2-6	1.11	+0.2	-1.1**
Insight	4.0	2-6	1.35	+0.0	-1.3**

(1) “neutral score” is a score of 4 on a 1-7 numerical scale

(2) overall mean = 5.3

** p < 0.01

*p < 0.05

The questionnaire results were also analysed to compare the responses of managers (n=6) and non-managers (n=6), to explore whether these different groups value outcomes differently. There was no significant difference in the overall mean for each group (managers overall mean = 5.4, non-managers overall mean = 5.2). The greatest difference between their ratings of individual outcomes was in the importance of opportunities for persuasion; this was ranked higher by managers than non-managers (5.0 to 3.5), but this was not significant ($p > 0.05$). The researchers had considered that non-managers may place a higher value on power levelling, as they themselves had less institutional power, but there was no significant difference between managers and non-managers (4.3 to 4.0, $p > 0.05$).

Results were also compared between interviewees who had been in the public service for 5 years or fewer (n=6) versus those who had been in the public service for longer (5 years or more, n=6). It had been considered that the outcomes valued by public servants may vary through their careers. There was no significant difference in the overall mean for each group (5.4 for those in the first 5 years, 5.2 for interviewees who had been in the public service for five years or longer, $p > 0.05$). However, experienced public servants were significantly more likely to value mental model alignment as a very important outcome (6.7 to 5.0, $p < 0.05$). In the interviews, more

experienced public servants described “shared understanding” (possibly equivalent to mental model alignment) as critically important in group decision-making.

DISCUSSION AND CONCLUSIONS

This study has several important limitations, and caution should be taken in extrapolating results to other situations. The results are likely to be most relevant for the public sector, which could be a growing market for group model building interventions. For some outcomes that were viewed as important, there is little evidence on which to determine whether group model building is relevant, and these are potentially important research gaps. Finally, what clients want from group-decision processes has important implications for how we conceive of group model building as a service. Each of these topics is explored further below.

Limitations

This study investigated the stated beliefs of a small number of New Zealand public servants, to determine what outcomes they value as important in group decision-making. These were then related to recently reported outcomes of group model building.

The individuals were selected by their agencies as those who most-regularly commission or conduct group-decision processes, and so are likely to be the most relevant subjects for understanding potential group model building clients in the New Zealand public sector. Twelve individuals were interviewed. For detailed qualitative research, this number proved sufficient to achieve data saturation. For quantitative research, however, the sample size is small. The quantitative data was primarily used to validate the results obtained by the interviews, and should be used with caution as stand-alone measures that are representative of any broader group.

This study relies on individuals’ own stated preference for different outcomes. It is possible that these do not represent individuals’ actual preferences, though it is not obvious why individuals’ would (for example) choose to downplay their interest in improving decision-quality through insight. It may be preferable to explore potential clients’ revealed preferences (Samuelson, 1938), rather than stated preferences, but collecting this data would be more challenging.

The framing of the interview as relating to “group decisions” may have led interviewees to focus on interpersonal (group) aspects. Perhaps asking instead about (for example) “solving complex problems” would have revealed greater preference for decision-quality rather than group agreement. Different outcomes are likely to be important in different settings, however group participation is one of the defining aspects of group model building so framing the possible problems as “group decisions” did not seem inappropriate.

This study provides insights into the outcomes that are important to New Zealand public servants in commissioning and conducting group-decision processes. The results are consistent with international trends toward interagency and inter-stakeholder group decisions (Newman, 2004, and as explored further below), but it has not been demonstrated that these client-beliefs apply to other countries.

Preferences in the private sector may vary from those in the study due to the different incentives of the commercial environment. Nonetheless, this study supports recent group model building research as applicable to potential-clients' interests.

A growing market?

Many problems faced by public sector organisations are highly complex, with multiple actors, multiple stakeholders, and conflicting outcomes (White 2003). This makes public policy questions obvious targets for the problem-solving and problem-structuring applications of system dynamics (Rose and Haynes 1999).

Two trends appear to be increasing the use of group-decision processes in the public sector. Instances of failed policy on issues that span organisational boundaries has driven demand for greater connectivity between agencies (Treisman, 2007) – in New Zealand this has manifest in calls for greater interagency coordination by the “Better Public Service” initiative (State Services Commission, 2011). Decisions based on consensus between stakeholders are thought to be more enduring than those arbitrated by government decision, leading to increased use of collaborative governance (Newman *et al.*, 2004; Ansell and Cash, 2008; Emerson *et al.*, 2012) – in New Zealand this is being trialled through the consensus-based “Land and Water Forum” (Eppel, 2013). This growing field lacks agreed and accepted methods for supporting group decision making (Kim, 2008; Plottu and Plottu, 2011; Eden and Ackermann, 2013). The opportunity for group model building in the public sector appears large, and is likely to be growing even larger (Bayley and French, 2008).

Implications

To determine the potential of group model building to fill this opportunity, it is important to develop a sound empirical basis for the use and selection of group model building techniques. This empirical base should relate to the outcomes that potential clients are looking for.

The results of this study suggest that, in most settings, public servants are primarily interested in efficiently reaching an agreement between participants (consensus). Participants should be willing to publically endorse these agreements, and to act on them when appropriate (commitment to conclusions). These are areas where there is strong evidence to support group model building as effective (Vennix *et al.*, 1993; Huz, 1999; Vennix and Rouwette, 2000; Dwyer and Stave, 2008; Eskinasi *et al.*, 2009; Rouwette, 2011; Scott *et al.*, 2014).

It is important that these agreements last. Government can move slowly, and commitment to these agreements must persist until the agreement can be put into action. While some group model building research evaluates enduring mental model change and alignment (Huz, 1999; Scott *et al.*, 2013), further research is needed to evaluate enduring agreement and the durability of commitment. It may be difficult to evaluate these outcomes due to problems of attribution (Rohrbaugh, 1987; McCart and Rohrbaugh, 1989, 1995; Shadish *et al.*, 2001).

Public servants are also interested in several outcomes for which the evidence is more limited. They are concerned by the speed it takes to reach a decision, for which group

model building literature can provide only indirect evidence (participants making comparisons to hypothetical meetings, Vennix *et al.*, 1993; Vennix and Rouwette, 2000; Scott *et al.*, 2014). They are also interested in building trust and goodwill between participants, that in turn fuels future cooperation, an area that requires evaluation in group model building literature.

The lukewarm attitudes to achieving new insights were somewhat surprising, as was the general lack of interest in policy quality. Interviewees often seemed so focussed on reaching any agreement, that policy quality seemed a lesser concern. This is likely to be important as group model building practitioners think about how to describe the potential benefits of their techniques to potential customers.

Despite broad variance across different decision contexts, the results of this study showed generally strong support for interpersonal outcomes relating to trust and agreement, and generally less support for outcomes relating to policy quality. A similar distinction is evident in two contrasting perspectives of group model building sessions (Andersen *et al.*, 2007). One perspective considers the model as an allegedly realistic representation of the external policy environment (“micro world” – Zagonel, 2002; “virtual world” – Serman, 2004). The second perspective considers the model as a socially constructed artefact for building trust and agreement (“boundary object” – Zagonel 2002; Black and Andersen 2012; Black 2013; Franco, 2013; Scott, 2013; “transitional object” – Eden and Ackermann, 2006). This study suggests that, in group-decision processes in the public sector, the “boundary object” perspective may be most applicable.

In conclusion, this study demonstrates that even within the public sector there exists a broad range of different group-decision contexts with different aims. In general, the research subjects preferred consensus and commitment to cognitive change, which suggests the boundary object perspective of group model building may be most relevant to their needs. Most outcomes reported in group model building literature are valued by potential clients, but more research is required to compare the process efficiency of group model building with other methods.

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