

# Group Model Building Wins: The results of a comparative analysis

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## Abstract

*This paper presents clear evidence of the value of group model building for supporting group decision processes. It responds to Rouwette et al.'s (2002) challenge to take GMB assessments beyond unstructured single case descriptions that cannot be easily compared. This paper compares two parallel, real-world problem solving teams examining urban growth issues in Las Vegas, Nevada over the same two-year time period. One followed a system dynamics group model building process. The other used a more traditional group facilitation process. Data about the dynamics of discussions and the outcomes were collected from meeting transcripts, participant interviews, written documents and direct observations. The results reveal a marked difference in the content and timing of discussions over the life of each group project, strongly supporting the hypothesis that system dynamics provides a better foundation for structuring discussions, eliciting mental models, and generating sound decisions.*

**Keywords: Group Model Building (GMB), public participation, public policy, group facilitation, team performance**

## Introduction

In 2000, Vennix argued that Group Model Building offered significant advantages over traditional group problem solving approaches. Since that time, researchers have been working to find ways to measure the difference. In 2002, Rouwette, Vennix, and van Mullekom (2002) published a meta-analysis of group model building assessments. Of the 107 cases they examined, most were single case studies that examined the change that occurred over time. While 88% of cases produced positive results, the authors noted that the diversity of methods and definitions made it difficult to compare the cases, and challenged the system dynamics community to move away from single case study descriptions. This study responded to their challenge by comparing the performance of

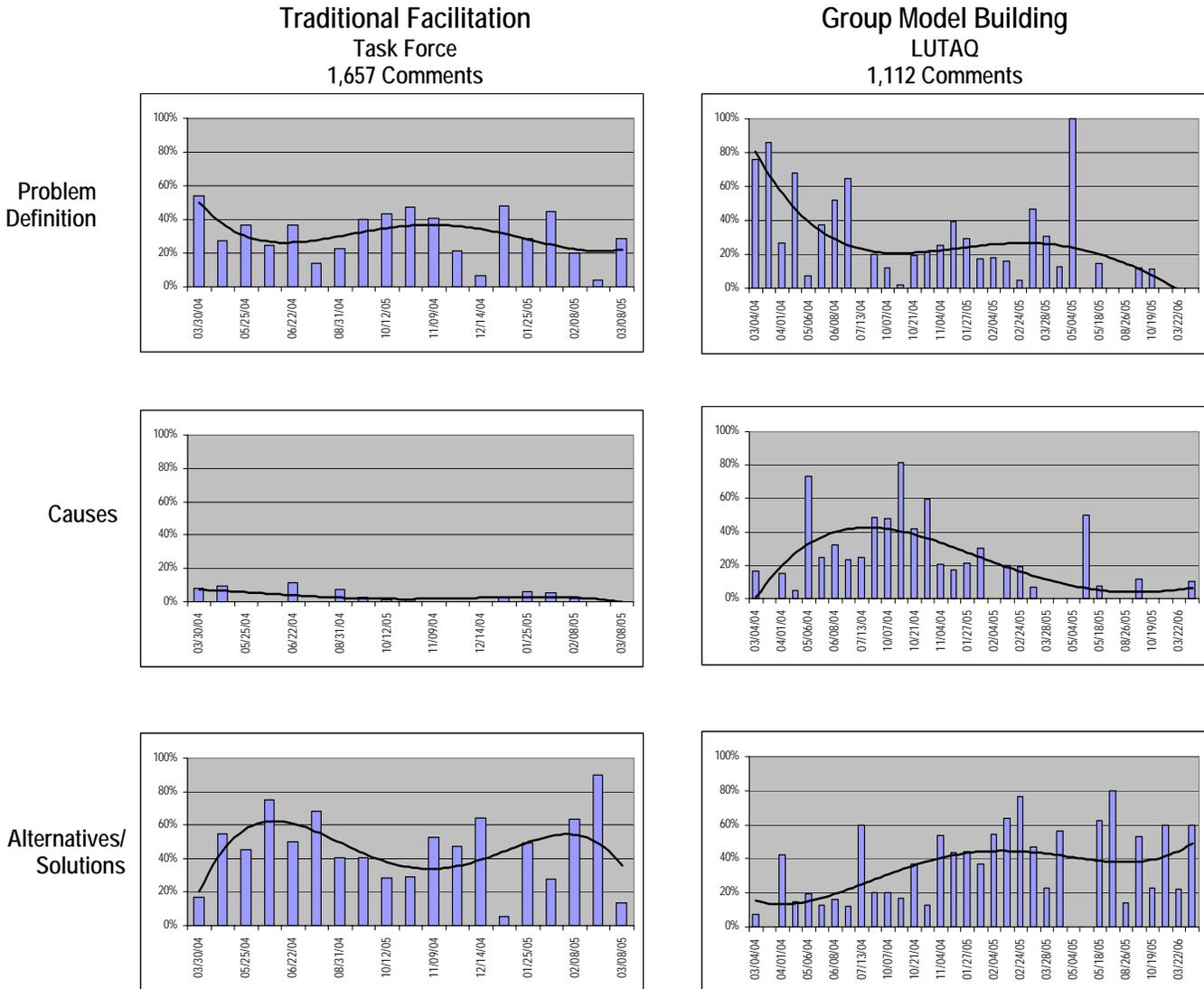
two similar groups examining urban growth issues in Las Vegas over the same two-year time period. Stakeholder groups of this type are increasingly being used by municipal governments to support public policy development. The two stakeholder groups studied were formed independently in March 2004 by different government entities with the purpose of making recommendations related to managing growth in the Las Vegas metropolitan area. The first group, called the Clark County Community Growth Task Force (Task Force), reported to the Clark County Board of Commissioners and consisted of 17 citizen members representing one of seven different interest areas. The Task Force met 21 times over a 13-month period and was facilitated by two professional facilitators working together. The second group, the Land Use, Transportation, and Air Quality (LUTAQ) Working Group, reported to the Southern Nevada Regional Planning Coalition, and consisted of 12 to 15 staff representatives of 11 different local government entities. The LUTAQ Working Group met 42 times over an 18 month period. The LUTAQ Working Group was facilitated by the authors of this paper using a system dynamics group model building approach.

The relative performance of and the nature of the discussion that occurred in each group were assessed and compared. The results reveal a marked difference in both performance and the nature of discussion. The assessment of group performance revealed that despite a slight disadvantage in ‘input’ variables, the group model building team achieved a higher level of performance in both process and output variables. Analysis of the discussion – examining why outcomes might differ – reveals a distinct difference in the process.

### **Key Differences**

The most significant difference between the two groups is shown in Figure 1, which displays the dynamics of the nature of the discussions in both groups. Each column of graphs shows the distribution of participant comments relating to problem definition, causes of the problem, or potential alternatives or solutions to the problem. The first

column describes discussions in the Task Force group, which was facilitated using traditional group facilitation methods. The second column describes the LUTAQ group, facilitated using a group model building approach.



**Figure 1. Percent of Comments by Category over the Project Life**  
 (Trend lines were added using a polynomial best-fit operation)

Assessing the nature of the discussion that occurred over the life of each project was accomplished by categorizing all the comments made during meetings that were available in minutes, notes, or on video. A total of 1,657 comments made during 20 of the 21 meetings of the Community Growth Task Force (traditional facilitation), and 1,112 comments made during 40 of the 41 of the LUTAQ Working Group (group model building) were categorized into one of five categories:

- Mission or process
- Problem definition
- Causes
- Alternative/Solution development (including discussion of consequences).
- Other

The coding protocol was developed using grounded theory (Strauss and Corbin's 1990), to draw keywords from the data itself. The results are arrayed as percentages by major category (except 'other') over the life of each project (figure 1).

The trends in the problem definition, causes, and alternatives graphs for the traditionally facilitated group (figure 1, column 1) show that discussion jumped quickly from problem definition to alternative generation, with virtually no discussion of causes. The trend lines of all three graphs show a lack of central tendency. The relative amplitude of the trend lines shows that alternative development dominated the discussion for almost the entire life of the project with one exception: a mid-project return to discussion of the problem definition.

Despite professional facilitation, the traditionally facilitated group skipped over problem definition and causes and went right to alternative generation which dominated the discussion throughout the process. Roughly 30% of the discussion in all the traditionally facilitated meetings for the entire two-year period focused on the problem, over 40% of the discussion focused on solutions, and less than 5% of the discussion focused on problem causes. (The remaining comments concerned the mission of the group.)

By contrast, the same graphs for the group facilitated using a group model building approach (figure 1, column 2) show a distinctive central tendency of similar amplitude in each of the graphs. The trend lines move sequentially across the graphs in a wave-like motion, showing that the group discussion moved through the stages (problem definition, causes, alternative generation) sequentially.

While these results provide insight into the difference in the discussion, they do not tell us whether one process was better than the other -- only that they are different. The performance analysis provides the other half of the story.

### How did the Groups Perform?

The results of the performance analysis are presented in a 'scorecard' format (tables 1 and 2). The relative degree of performance of each group for each performance variable category is indicated by the position on an inverted triangle in the far right column. An explanation of how the analysis was conducted follows the presentation of the results.

**Table 1: Relative Degree of Achievement: Output**

Variable Category	Attributes	Degree of achievement				
		Not at all	Partially	Marginally	Largely	Fully
Mission	The mission was accomplished.			▽	▼	
Consensus	Consensus was achieved		▽		▼	
Commitment	Members feel pride in their accomplishment. Members exhibit support for the final product.				▽	▼

▼ = Group Model Building (LUTAQ Working Group)  
 ▽ = Traditional Facilitation (Community Growth Task Force)

**Table 2: Relative Degree of Achievement: Process Variables**

Variable Category	Attributes	Degree of achievement				
		Not at all	Partially	Marginally	Largely	Fully
Communication	Members communicate actively, openly, and effectively with each other. All members are engaged in discussions, and practice two-way communication (talking and listening). Discussions are rich in breadth and substance. Diverse views are valued and sought.		▽		▼	
Collaboration	Morale is high. Members play-off each other in a manner that creates synergy and creativity. Members recognize their interdependence. Members care about each other, trust each other, and treat each other with respect. Members exhibit back-up behavior.			▽	▼	
Conflict Management	Conflict is managed and resolved in a productive (win-win) manner.		▽		▼	
Decision-making	Issues are fully explored before a decision is called for.		▽		▼	
Commitment	Members are engaged. They show-up and participate actively. Members exhibit zeal, enthusiasm, and esprit-de-corps.			▽		▼

▼ = Group Model Building (LUTAQ Working Group)

▽ = Traditional Facilitation (Community Growth Task Force)

**Table 3: Relative Degree of Achievement: Input Variables**

Variable Category	Attributes	Degree achieved				
		Not at all	Partially	Marginally	Largely	Fully
Mission	The mission, goals, and performance objectives are clear, shared, supported, and are used to guide and adjust plans, deliberations, and activities	----- ----- ----- -----				
Team Structure and Composition	The team is structured and populated to include the fewest number of members necessary to represent all relevant interests, to provide the knowledge and skills needed, and to provide balance in terms of interests, views, and skills.	----- ----- ----- -----				
Roles	Roles are clearly articulated, are assigned to members with the knowledge, skill and ability to carry-out their assigned duties, and are accepted by members. Members carry-out their duties in an effective manner.	----- ----- ----- -----				
Boundary Management	The rules for interaction between the team and sponsoring entity and other interested parties are clearly articulated, are understood and supported, and are followed.	----- ----- ----- -----				
Project Management	The project is managed according to a plan designed to accomplish the mission in an efficient and effective manner. The plan and associated operating procedures (including ground rules) are clearly articulated, and are understood and supported by the members. Implementation is monitored, evaluated, and plans and procedures are adjusted as needed.	----- ----- ----- -----				
Resources	All resources required for the team to achieve its mission are delivered in a timely and effective manner.	----- ----- ----- -----				
Conflict Management	A strategy for resolving conflict is identified, understood, supported and followed.	----- ----- ----- -----				
Decision-making Process	A decision making process is established, understood, supported by team members, and followed.	----- ----- ----- -----				
Commitment	Members are committed to the mission.	----- ----- ----- -----				

▼ = Group Model Building (LUTAQ Working Group)  
 ▽ = Traditional Facilitation (Community Growth Task Force)

The performance scorecards reveal that despite a slight disadvantage in several input variables (table 3), the group facilitated using a group model building approach outperformed the traditionally facilitated group in all process (table 2) and output categories (table 1). This finding is based on the findings that the groups exhibit similar characteristics in input variables (even a slight advantage in the traditionally facilitated group), as well as in task and context characteristics, but differed significantly in the degrees of collaboration (and other process variables depicted in table 2) and consensus (and other output variables depicted in table 1) achieved. While the assessments are qualitative, they are derived from multiple sources of evidence and were made according to a detailed research protocol that was designed to produce the same results independent of the observer/analyst.

### **Performance Assessment Methodology**

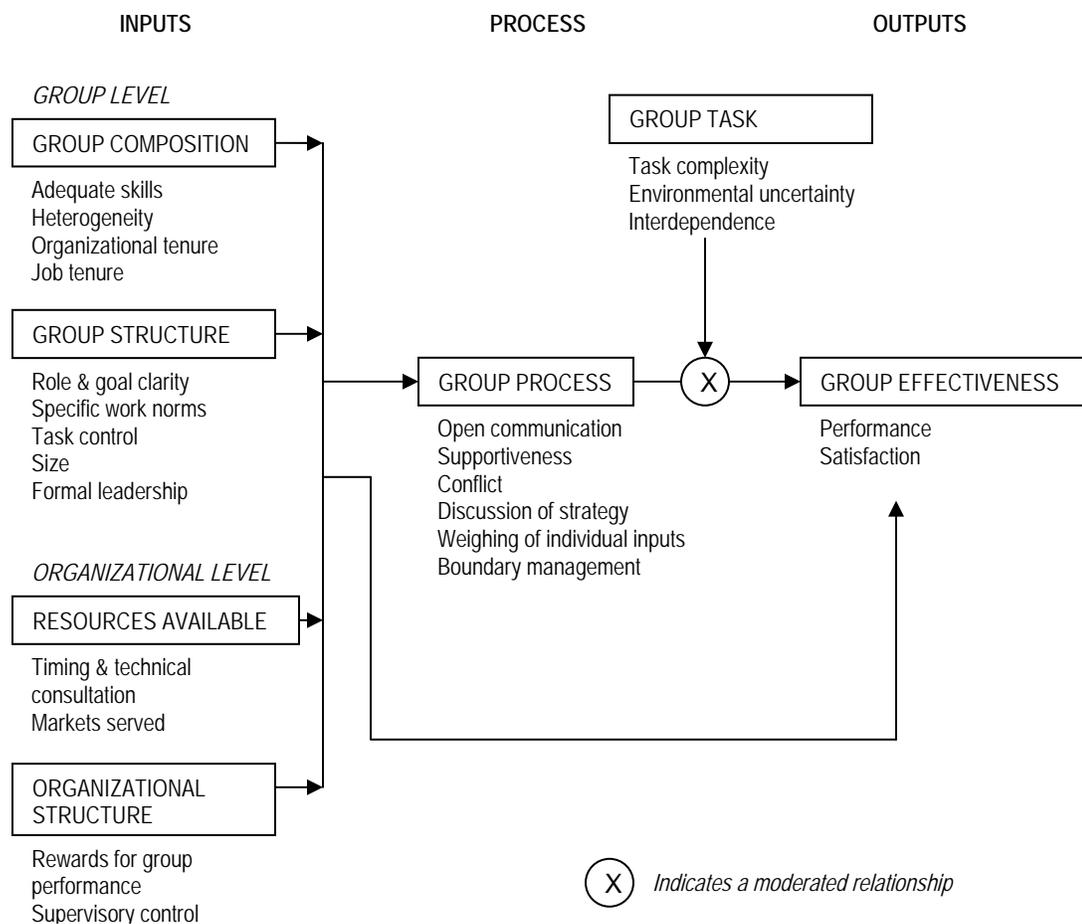
Several methodologies for deriving team performance measures were assessed for application in this project. Dickenson and McIntyre's (1997) framework for developing teamwork measures was selected for its scientific rigor. The steps in the methodology (1997) are:

1. Identify a model of team performance for the particular type of team
2. Use the model to identify variables to be measured in each category (input, process, and output).
3. Identify attributes for each variable
4. Identify observable behavior for each attribute
5. Develop decision rules and a measurement scale for coding each behavior

Dickenson and McIntyre's methodology was supplemented by Strauss and Corbin's (1990) grounded theory for qualitative research to develop decision rules for assessing behavior, and for coding comments.

## Step 1 – Team Performance Model

After reviewing several team performance models, Gladstein’s ‘General model of group behavior’ (figure 2) was selected (Gladstein 1984: 502). The Gladstein model was selected for its consistency with the conceptual framework for assessing group model building interventions (Rouwette and Vennix 2003). The Gladstein model also reinforces the importance of similarity in task and environmental characteristics in conducting a comparative analysis as these are ‘moderating’ factors in group performance.



**Figure 2. General model of group behavior: Constructs and measured variables (Gladstein 1984: 502)**

## Step 2 – Variables

Several researchers (Wheelan 2005; Leholm and Vlasin 2006; Dickenson and McIntyre 1997; Hensey 2001; Keen 2003; and Innes and Booher 1999) have identified the characteristics exhibited by successful teams. Table 3 shows these characteristics in 12 categories.

**Table 3. Characteristics exhibited by successful teams.**

Variable Category	Characteristics
Mission	The mission, goals, and performance objectives are clear, shared, supported, and are used to guide and adjust plans, deliberations, and activities.
Team Structure and Composition	The team is structured and populated to include the fewest number of members necessary to represent all relevant interests, to provide the knowledge and skills needed, and to provide balance in terms of interests, views, and skills.
Roles	Members roles (including leadership and facilitation) are clearly articulated, are assigned to members with the knowledge, skill and ability to carry-out their assigned duties, and are accepted by members. Members carry-out their duties in an effective manner.
Boundary Management	The rules for interaction between the team and sponsoring entity and other interested parties are clearly articulated, are understood and supported, and are followed. Members do not feel undue pressure or coercion from forces outside the team.
Project Management	The project is managed according to a plan designed to accomplish the mission in an efficient and effective manner. The plan and associated operating procedures (including ground rules) are clearly articulated, and are understood and supported by the members. Implementation is monitored, evaluated, and plans and procedures are adjusted as the team sees fit.
Resources	All resources required for the team to achieve its mission are delivered in a timely and effective manner.
Communication	Members communicate actively, openly, and effectively with each other. All members are engaged in discussions, and practice two-way communication (talking and listening). Discussions are rich in breadth and substance. Diverse views are valued and sought.
Collaboration, and Cohesiveness	Morale is high. Members play-off each other in a manner that creates synergy and creativity. Members recognize their interdependence. Members care about each other, trust each other, and treat each other with respect. Members exhibit back-up behavior.
Conflict Management	Conflict is managed and resolved in a productive (win-win) manner.
Decision-making Process	A decision making process is established and followed. Decisions are made in a manner that is appropriate for the context, and that is supported by team members. Issues are fully explored before a decision is made.
Commitment	Members are engaged. They show up and participate actively. Members exhibit zeal, enthusiasm, and esprit-de-corps. Members exhibit a sense of responsibility and accountability for the outputs and outcomes.
Consensus	Consensus is achieved. Members support the final product.

### Step 3 – Attributes

Between two and 12 attributes were identified for each performance category from more detailed descriptions of each attribute and Gladstein’s model of group behavior (figure 2) was used to organize them into input, process, and output categories.

While the process and output variable categories speak most directly to group performance, ‘input’ characteristics, such as: the degree to which the mission is understood and supported by the members, the unique set of skills and personality traits each members brings, that availability of resources, decision-making procedures, the effectiveness of participants with special roles, and the nature of the relationship the group has with the sponsoring entity, affect group performance. In a laboratory environment, these are variables that would be controlled. Because this research makes use of real-world groups for which controlling these variables would be impossible, they are included with the variables being measured and compared (table 3).

### Step 4 – Observable Behavior

Data sources were identified (shown in table 4, column 1) and a set of observable behaviors was developed for each attribute by source (shown in table 5).

**Table 4. Data Sources**

Data Source	Community Growth Task Force	LUTAQ Working Group
Content Analysis	Agendas & minutes Hand-outs & slide presentations Charter and Process Plan Website contents Benefit cost analysis Final Report	Meeting agendas & minutes Hand-outs & slide presentations Model Documentation Primer Final Report
Observation	11 meetings (52%) –45 hours 2 Live 10 on video	41 meetings (98%) all live 60 hours
Interviews	5 members (29%) 3 managers	5 (45% of those attending at least 10 meetings) 2 managers

The data collection matrix (Table 5) was used to develop data collection instruments for each data source. A cross reference scheme maintained the relationship between observable behaviors and specific questions and observation guidelines in data collection instruments.

**Table 5. Data Collection Matrix (single entry)**

Variable Category	Attribute	Content Analysis	Observation	Interview
Mission	Clearly articulated	In writing?	Presented consistently in meeting(s)?	Mission clear?

### Step 5 – Decision Rules and Measurement Scale

Behavioral observation scales (Figure 3) and an associated set of decision rules (Table 6) were developed for each attribute using Dickenson and McIntyre’s framework.



**Figure 3. Dimensional scale: Degree to which a behavior of interest was achieved**

**Table 6. Decision Rules**

Source	Degree to which a behavior of interest was achieved				
	Not at all	Partially	Marginally	Largely	Fully
Content Analysis	Active opposition and/or completely inconsistent behavior	Mostly passive opposition and/or inconsistent behavior	Evenly split support/behavior. No indication either way.	Mostly passive support and/or consistent behavior	Active support and/or completely consistent behavior
Observation	Active opposition and/or completely inconsistent behavior	Mostly passive opposition and/or inconsistent behavior	Evenly split support/behavior. No observation either way.	Mostly passive support and/or consistent behavior	Active support and/or completely consistent behavior
Interviews	None support	Opinion split but majority do not support.	Opinion split evenly. No indication either way.	Opinion split but majority support.	All support

## Scorecards: Presenting the Results of the Performance Analysis

The position of the marker (an inverted triangle) for each team's performance level (tables 1, 2 and 3) represents the mean of the all attributes associated with a particular variable. For example, in the input variable table (table 5), under the mission category (line 1) the position of the markers along the performance scale (column 3) represents the combined mean of the six attributes in this category:

- The mission is articulated
- The mission is clear
- The mission is understood by members
- The mission is supported by members
- Progress toward achieving the mission is monitored throughout the process
- Feedback on progress is used to adjust activities

While there is some risk in combining the results in this way, the purpose is to provide a summary level assessment of the degree to which each team achieved the characteristics associated with a particular variable category.

### **Why are these differences important?**

The clear differences in the pattern of discussion and the performance measures both support the value of group model building for group decision processes and help explain why the differences occurred. The discussion analysis revealed a marked difference in the content and timing of discussions over the life of each group project, strongly supporting the hypothesis that system dynamics provides a better foundation for structuring discussions, eliciting mental models, and generating sound decisions.

From the process analysis, it is clear that the traditional problem-solving facilitation process did not include a step leading the group to a common view of what is causing a problem. One participant in the traditionally facilitated group observed: *We kept mixing the problem and potential solutions in the same pot and that confused us.* By failing to

foster a common view of what causes a problem, traditional facilitation fails to provide the means to integrate diverse views at a critical stage of the problem solving process. This in turn inhibits the achievement of consensus in assessing the benefits and costs associated with alternatives, and selecting an alternative.

Analysis of the group model building process revealed that it supplied a more complete and coherent problem solving process, including significant discussion of the causes. Member comments confirm that the group model building approach provided the means to incorporate diverse views. For example, members of the group model building group observed:

- *We had a very eclectic group – and the diversity was a good thing. The model was a good vehicle for discussion – it was how we learned.*
- *It would have been hard for a single person to steer it in some direction because the model simply wouldn't allow it.*
- *[The modeling process] removed the isolation. As we got into the process, the jurisdictional boundaries disappeared and we really started looking at the problem from a regional basis.*
- *We achieved strong consensus because we were involved in the development of the model – the hood was up.*

### **Note about Traditional Facilitation**

While the findings reported here suggest that a system dynamics group model building approach can produce higher degrees of group performance under certain circumstances, they should not be interpreted as a rejection of the tools and processes associated with 'traditional' facilitation. These tools and processes have their place. Zagonel (2004) found that effective group problem-solving requires a balance of attention to the problem and the group dynamics. While the system dynamics group model building approach assessed here appears to have provided a more effective balance in this case, more work remains to blend the two approaches.

Finally, it is worth noting that there is a risk in labeling the professionally facilitated but non model-building approach ‘traditional facilitation.’ Doing so opens debate on whether there is such a thing as a ‘traditional’ facilitation approach. As McFedzean (2002) points out, there is considerable latitude in how facilitation is carried out in practice. But the same argument is made for the group model building approach. Rouwette et al. (2002) observed considerable variation in group model building interventions. Rather than debate the question of whether each specific process is representative of its label, the specific mechanisms of each intervention were documented using the proposed framework for assessing group model building interventions (Rouwette et al. 2002) so as to allow this research to be added to the greater universe of group model building assessments that can be used to better understand the relationships between context, mechanism, and outcome.

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