

A Review of Participatory Techniques/Mechanisms and the Development of an Evaluation Procedure in the Context of Community-based Earthquake Risk Management

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Synopsis

The aim of this paper is to review the participatory techniques/mechanisms in terms of their usefulness in the context of community based earthquake disaster management. The present approaches to evaluation of participatory processes are presented and criticized for their inability to meet the needs and specifics of the context of disaster management. The participatory techniques/mechanisms are seen as platforms for knowledge exchange among different actors. A Mental Model's based procedure for mapping and measuring preparedness is proposed and its applicability evaluated.

Keywords: process evaluation methodology, participation, risk communication, community-based disaster management, mental models

1. Introduction

Community-based earthquake disaster management, participatory methods and techniques, procedures are very hot topics in Japanese disaster management practices. After the Kobe Earthquake in 1995 local governments realized that they are not any more able to provide sufficient services to the citizens in the time of earthquake occurrence. During the recovery process after the Kobe Earthquake various voluntary organizations: NGO/NPOs – started their activities, and some of the activities have lasted up to now (Shaw, 2004). The purpose of the NPO activities is to raise awareness and preparedness of the citizens in order to increase their coping capacity. Many of

the workshops that are being organized are participatory events, aiming at active involvement of “communities” in disaster prevention activities. Also the citizens have their own attitudes and wish to achieve better preparedness but sometimes they do not know how to do it. NPO activities and efforts are to facilitate expected changes toward better earthquake preparedness. Therefore, the events organized by NPO organizations are to some extent two way risk communication events where the so called “professionals” can learn from the “citizens” and vice versa. However until now, nobody has tried to assess the effectiveness of the workshops provided by local governments and NPO organizations. That is why in this paper we would like to review the state of

the art in literature on participation process evaluation and their potential usefulness (or lack of it) given the specific context of community based earthquake risk management. In case we find that the existing approaches do not fit our needs, we will try to propose alternatively our own approach to the assessing effectiveness of the participatory community-based earthquake risk management.

2. Defining Participation

“Participation” is a widely used “keyword” which often means different things to different people who are using this term. Therefore before we start our analysis of participation mechanisms/methods it is necessary to define what we mean by participation. We define participation after Bishop and Davis as expectation that citizens have a voice in policy choices (Bishop, Davis 2002).

3. Why Participation?

Dienel and Renn (Dienel, Renn 1995) mentioned that knowledge is usually a key variable in coping with many problems but what makes present situation paradoxical is that in most problems even if we have better knowledge the problems continue to exist. It means that there are other factors causing this situation. Dienel and Renn state that the difficulty with these problems is that they defy any mono-casual scheme of explanation. All these problems are caused by many factors, but they have one characteristic in common: they demonstrate the inability of present administrative and governing systems to cope with pressing challenges. They, the administrative and governing systems, are reactive but they do not anticipate (Renn, Dienel, 1995). The participatory techniques and mechanisms are seen as the ones that enable the indigenous knowledge to influence the governance thus becoming more tailored to the needs of policy recipients.

4. Existing Approaches to the Evaluation of Participation

At this point we will review the present approaches to the evaluation of participatory processes. First we will review the approach based in “fairness and competence” by Renn, O., Webler, T., & P. Wiedemann (1995). Then we will examine the evaluation procedure using social goals proposed by Thomas C. Beierle (Beierle, Thomas C. 1998). Next we will discuss the study by Webler, T. and Tuler, S. (2001) on what constitutes the good policy process in the eyes of the participants of the process.

In their book: “*Fairness and competence in citizen participation: Evaluating models for environmental discourse*”, Renn, Webler and Wiedemann proposed a “fairness and competence” framework for evaluation of participatory processes, by building on Jürgen Habermas theory of communicative action (Habermas 1984, 1987). The question asked by the authors is the following: since different parties having different, often opposite interests, are engaged in the process, the evaluation criteria should be set up according “to whom?”, or to which group? Because of that we should not expect any desirable *outcome*, because the outcome is always an outcome according to somebody. The *outcome* is not important but the process itself should be “fair and competent” where *fairness* means that everyone who is affected by the decision should have an equal chance to take part in, and have influence on the decision making procedure’s *outcomes* (Webler 1995). And *competence* is a *construction of the most valid understandings and agreements possible given what is reasonably knowable at the time*, (Webler, 1995 p.58). *Competence* means that everyone who is taking part in the process is able to understand all the issues related to the process. In other words, if the process is fair and competent, the outcomes will be fair and competent as well. This provides

qualitative frameworks for evaluating whether given methods/mechanisms of participation are found less fair and competent. This approach is an example of process oriented approach.

Another approach for evaluation of public participation was the one proposed by Thomas C. Beierle (Beierle, 1998), who emphasized the importance of the outcomes of the process. Beierle argues that every participatory process should achieve six societal goals:

1. Educating and informing the public
2. Incorporating public values into decision-making
3. Improving the substantive quality of decisions
4. Increasing trust in institutions
5. Reducing conflict
6. Achieving cost-effectiveness.

Beierle has also classified the different participatory mechanisms/techniques in accordance to

the four following criteria:

- information flows

the degree of interaction among potentially opposing interests (Fig. 1 after Beierle 1998)

- the type of representation, and
- the decision making role of the public (Fig. 2 after Beierle 1998)

The thinking standing behind this classification is that certain mechanisms support achieving certain number of social goals. For example:

- **Information flows:** the mechanisms which provides information about the public to the government "Group A" will be useful mainly for providing decision-makers with public values, assumptions, and preferences (Goal 2) and substantive information to improve decisions (Goal 3) the mechanism which provides information from the government to the public "Group C" will be mainly

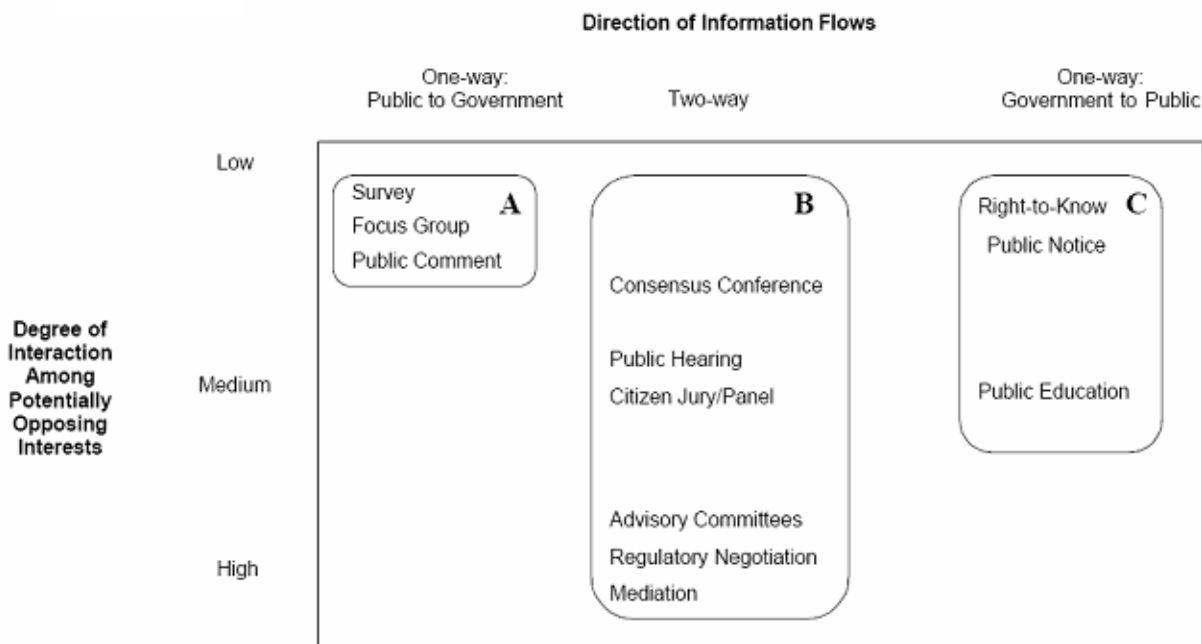


Fig.1

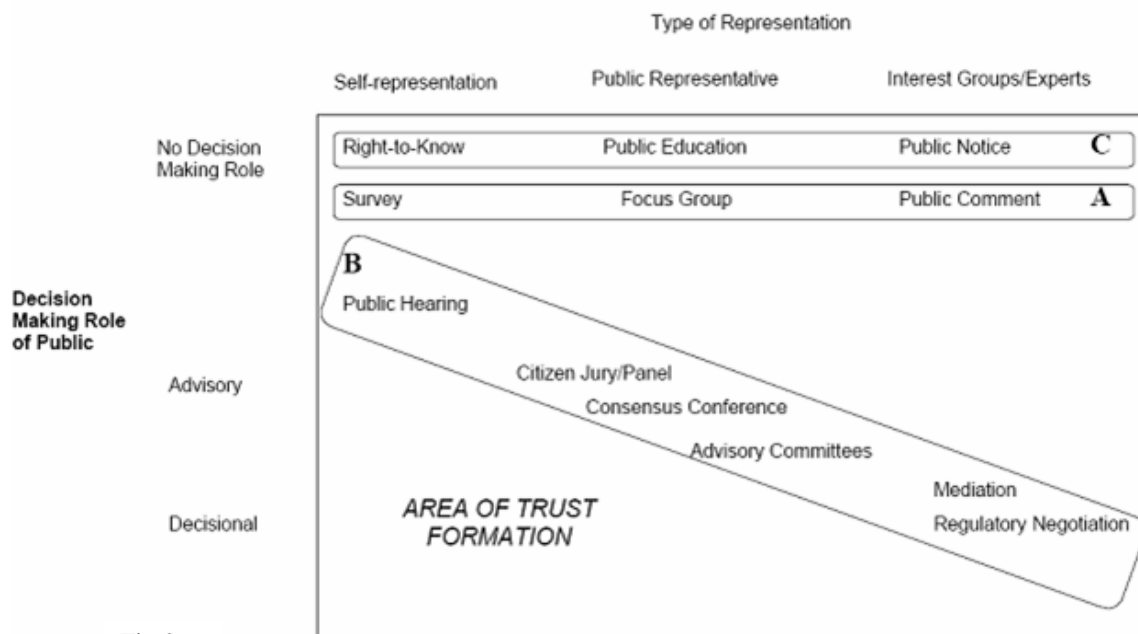


Fig.2

useful for increasing public knowledge (Goal 1) and, to the extent that it increases transparency, trust in institutions (Goal 4). The mechanism which allows for two-way flows “Group B” is expected to achieve all of these first four goals.

- Interaction among potentially opposing interests: the greater the degree of interaction among potentially opposing interests, the greater will be the opportunity for reducing conflict among stakeholders (Goal 5). This applies mainly to mechanisms for Group B.
- The type of representation: All else equal, mechanisms in which the public represents itself (through direct participation) will be better at achieving the goals of education (Goal 1) and trust formation (Goal 4) than those where the general public is represented by "representative" members or professionals (such as lobbyists, etc.).
- The decision making role of the public: All else equal, the mechanism which provides the public, a direct decision-making role will be better at achieving the goal of trust formation (Goal 4) than otherwise. This applies mainly to the mechanism for Group B. (Beierle 1998)

Table 1 below shows how different goals may be achieved by using different mechanisms/techniques available to us. In summary Beierle’s approach emphasizes the importance of the evaluation of to what extent certain public participation mechanisms are capable or not capable to achieve six societal goals which Beierle thinks essential.

Webler and Tuler (2001) have studied a watershed management planning process and obtained responses from the participants on what is considered as a good public participation process. The study was conducted by using Q-Methodology (Stephenson, W. 1953) a unique combination of qualitative social research combined with factor analysis, which is useful especially in the assessment of subjective states, attitudes and behaviors.

The authors have classified the obtained responses into five discourses – process should be legitimate, process should promote a search for common values, process should realize democratic principles of fairness and equality, process should promote equal power among all viewpoints, and the process should foster responsible leadership.

Mechanisms	Goal 1		Goal 2	Goal 3	Goal 4	Goal 5	Goal 6
	education	information	public values	substantive quality	trust	reduced conflict	cost-effectiveness
Non-Deliberative Mechanisms for Obtaining Information From the Public							
Survey	○	○	●	●	○	○	●
Focus group	○	○	●	●	○	○	●
N & C Rulemaking	○	○	●	●	○	○	●
Non-deliberative Mechanisms for Providing Information to the Public							
Information provision	▶	●	○	○	●	○	●
Public Notice	○	▶	○	○	▶	○	
Public education	●	▶	○	○	●	○	●
Traditional Mechanisms							
Public hearing	○	●	●	●	▶	▶	●
Citizen Advisory Ctte.	●	▶	●	●	●	●	●
Public Deliberation							
Citizen Juries/Panels	●	▶	●	●	▶	▶	●
Consensus Conference	●	▶	●	●	○	▶	●
Alternative Dispute Resolution							
Mediation	○	○	●	●	▶	●	●
Regulatory Negotiation	○	○	▶	●	▶	●	●

○ = not applicable: ▶ = may be applicable: ● = applicable
(Table 1 after Beierle 1998)

5. Mental Model Approach Proposed to Evaluate the Effectiveness of Participatory Community-based Earthquake Risk Management Actions.

Most of the present approaches available for the evaluation of participatory mechanisms are focus on the process itself (Renn, Webler, Wiedemann 1995), or what in the eyes of participants constitutes a good process (Tuler, Webler 2001), or outcomes (Beierle 1998) of the participatory process. Most of the criteria and outcomes tend to be normative, like fairness and competence, or six social goals (why six not seven, thirty seven or two?). What seems to be still missing is such a way of what we (or anybody) would like to achieve in a certain context and subject matter.

The context of earthquake disaster management given a particular demands effective actions in to be taken timely in advance so that households, communities or societies may become better prepared on earthquake on the earthquake occurrence. Therefore the most important criteria that any management action should be evaluated against is so called *preparedness*.

Therefore in designing our evaluation methodology we need to propose or develop an approach and tools thanks such that we can examine whether our management actions are “producing” better preparedness for particular households or a community at stake.

Another very important issue in the research of evaluation and effectiveness of public participation is, what Turaga (2004) has noticed. That is the lack of research on “in process variables”, for example; what stage at which public is involved in the process, level of external communication between the participants and the agency, proposed degree of influence public has in decision-making, and scope for deliberation within the process. Research seems to be needed also to account for outcome variables. Evaluation should be made to link the outcome variable with “in process variables” so that the acceptability of decisions which affects particular outcomes can be examined.

In applying any evaluation methods for examining the effectiveness of participatory earthquake disaster management actions we need to include better *preparedness* as an important. As the tool for such an tools for evaluation we propose

Mental Models approach (Morgan, Fischhoff, Bostrom, Atman 2002)

The Mental Model Approach to risk communication was introduced by Granger Morgan, Baruch Fischhoff, Ann Bostrom and Cynthia J. Atman (2002).

“an effective communication must focus on the things that people need to know but do not already. Rather than conduct a systematic analysis of what public believes, and what information they need to make the decisions they face, communicators typically ask technical experts what they think people should be told. Rather than subject draft communications to empirical evaluation by individuals like those who will use them, communicators pass them around to staff or expert committees for approval. Those passing judgment may know very little about either the knowledge or the needs of the intended audience” (Morgan, Fischhoff, Bostrom, Atman 2002 p.19).

In Mental Models Approach we distinct 5 steps as follows (Morgan, Fischhoff, Bostrom, Atman 2002 p.19-21)

1. Create expert mental model

Create the expert mental model by reviewing experts knowledge about the nature of risk. As well as summarize it explicitly from the perspective for what can be done. In case of MM approach the summary of the analysis is represented as an influence diagram. Once it is created it allows experts to review and validate the diagram. The controversial topics/themes should also be reflected in the diagram. (we should take into account for example different styles of management and different ways of risk communication and thus participatory management should be thought of as a special way of risk communication)

2. Conduct qualitative interviews in order to get layman perceptions

To conduct open-ended interviews in order to elicit people’s beliefs about the hazard/disaster expressed in their own terms and words. Interview protocols are shaped by influence diagrams so that they can cover covers the potentially relevant topics. The interview should allow the expression of correct and incorrect answers as well.

Responses are analyzed in terms of how they correspond to experts’ model.

3. Conduct confirmatory questionnaire in order to measure distribution of beliefs

Conduct confirmatory questionnaire in order to assess the distribution of the beliefs captured in the expert model as well as in open-ended interviews.

4. Draft risk communications

Use the results from questionnaires to assess the gaps and misunderstandings than draft the communication and subject it to expert review to ensure its accuracy.

5. Evaluate communication

Test and refine the communication with individuals taken from selected population by conducting one-two-one read-aloud interviews, by focus groups, closed form questionnaires, etc. Repeat this process until the communication is attained as intended.

It is to note that mention that originally the Mental Model approach assumes the adjustment of laypeople’s risk perceptions to the risk perceptions of the expert’s (Local government leaders, NPO’s etc.). In our approach we intend to observe and evaluate also how the indigenous knowledge held by laypeople, has been released through the participatory process

and also to what extent affected expert's risk perceptions.

6. Steps of Mapping and Measurement based on Mental Model Approach for Evaluation Proposes.

1. Generate the data

Before a workshop starts, ask participants to write a "simple narrative story" on what kind of actions people can perform in order to better prepare against earthquake occurrence, what are the main constraints that makes difficult to prepare better etc. (Doyle, Radzicki, Trees 1998.)

Then record the workshop. The workshop itself is a means of "communication" and we can construct mental models through that process.

2. Map and Measure

a. Map: develop from the data the mental models of different group of participants.

b. Measure: measure the MM in terms of their:

- i. complexity: Senge (1990) distinguished two types of MM complexity: *Details Complexity* – amount of content (ex. Number of nodes and links) *Dynamic Complexity* – Number of feedback loops.
- ii. Frequency and/or percentage of concepts which are included in mental models.

3. Re-measure and re-map

Re-measure and re-map the MM of workshop participants after workshop interventions in terms their change intended by workshop organizer. (The usual procedure of MM approach ends up here)

4. Organize event

Organize the meeting (participatory event) where you can engage all the people in their mental model, re-shaping by:

- a. Showing your results (especially the MM diagrams) to all of the participants. Use personal computer and projector to display the models. (Vensim freeware):
- b. Ask participants to play with the models and reshape the models by adding the additional nodes and relations.

Record the meeting and measure the *detail complexity, dynamic complexity and frequency of the concepts mentioned and discussed.*

5. Evaluate the effectiveness

Evaluate the participatory risk communication by comparing the models from different phases of the process in terms of the *detail complexity, dynamic complexity and frequency of the concepts mentioned and discussed.*

The effectiveness of management action is interpreted to be greater as mental models become more complex and new knowledge is added.

This evaluation procedure allows also to test which means of risk communication (lecture, workshop, public meeting etc) is more or less effective in terms experiment of causing better preparedness.

7. An Illustration: Application of Mental Model Approach.

In order to examine the above-proposed approach we have conducted very simple experiment to observe change which can be measured by use of Mental Models.

7.1. Outline of the Experiment

The experiment was conducted to test the approach to measure prospective changes in Mental Models to be identified in terms of their *complexity*:

Details Complexity, and *Dynamic Complexity* (Senge 1990), as well as in terms of the frequency of concepts that are found to be included in mental models.

Details Complexity – amount of content (ex. Number of nodes and links)

Dynamic Complexity – Number of feedback loops.

7.2. Goal

The goal of experiment was to map and measure the extent to which participants mental models related to the concept of *Interviewing* had been changed, firstly as a result of knowledge stimulus (presentation).

7.3. Procedure

Group of participants consisted of 4 PhD students from Kyoto University. On the first day participants were asked to answer the following question:

Very often researchers from different fields are choosing "interviewing techniques" or

"depth-interviewing" to get the data needed for their research.

Explain in one paragraph or more (no more than 2 pages please), your best theory of how you "interviewing" as a research technique.

On the second day the participants were given presentation by one of the authors on *interviewing techniques*. After the presentation, they were asked again to answer in writing the same question as before.

The data were analyzed and coded by using Atlas.ti software and the mental models were developed. The models were measured in terms of their *Details Complexity*, and *Dynamic Complexity*, as well as in terms of the concepts included in mental models.

7.4. Results

7.4.1 Mapping

Pre – Model:

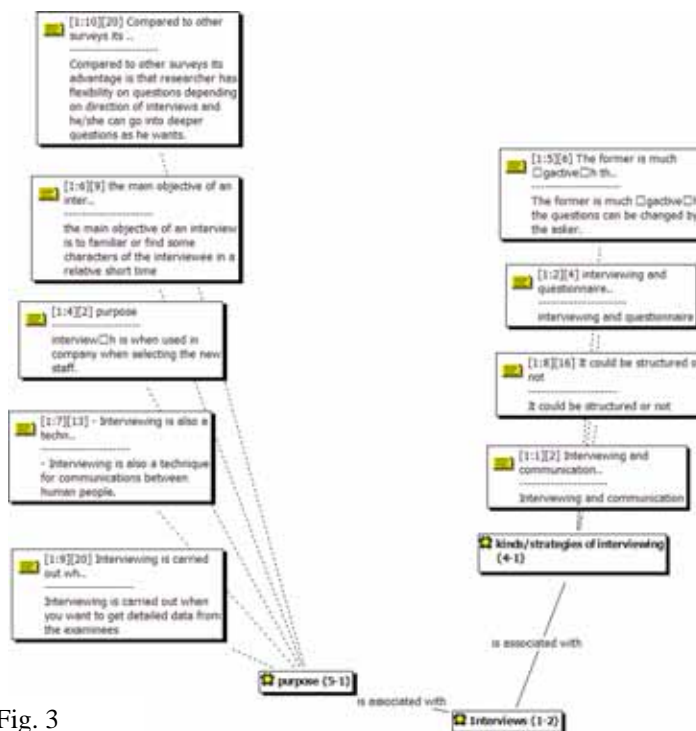


Fig. 3

The Model of the Presentation:

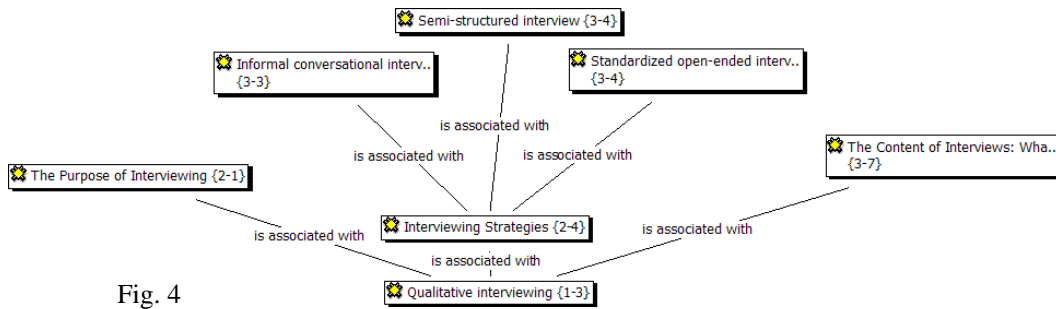


Fig. 4

Post - Model:

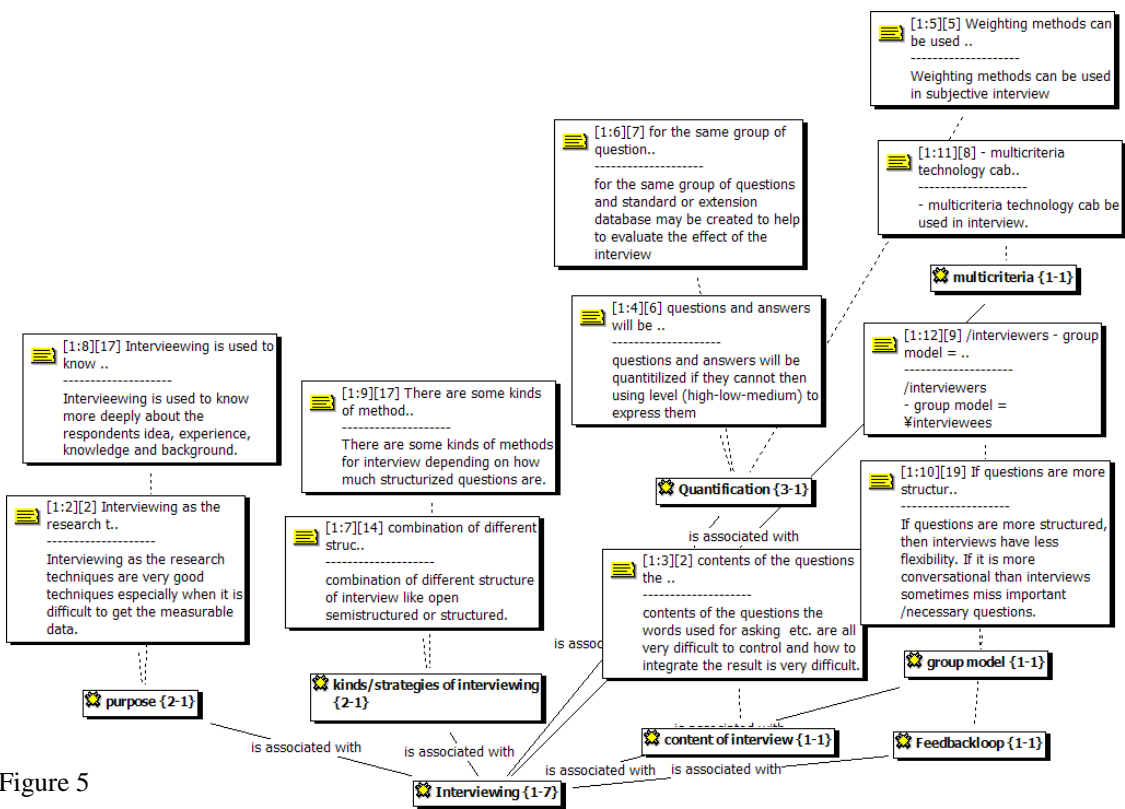


Figure 5

7.4.2 Measuring:

Details Complexity

Pre Model:20

Post Model: 29

Dynamic Complexity:

Pre Model: 0

Post Model: 1

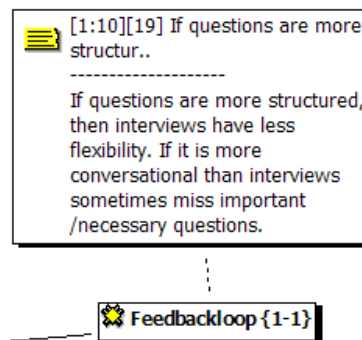


Fig. 6

Pre Model: -
Post Model:

Statistics

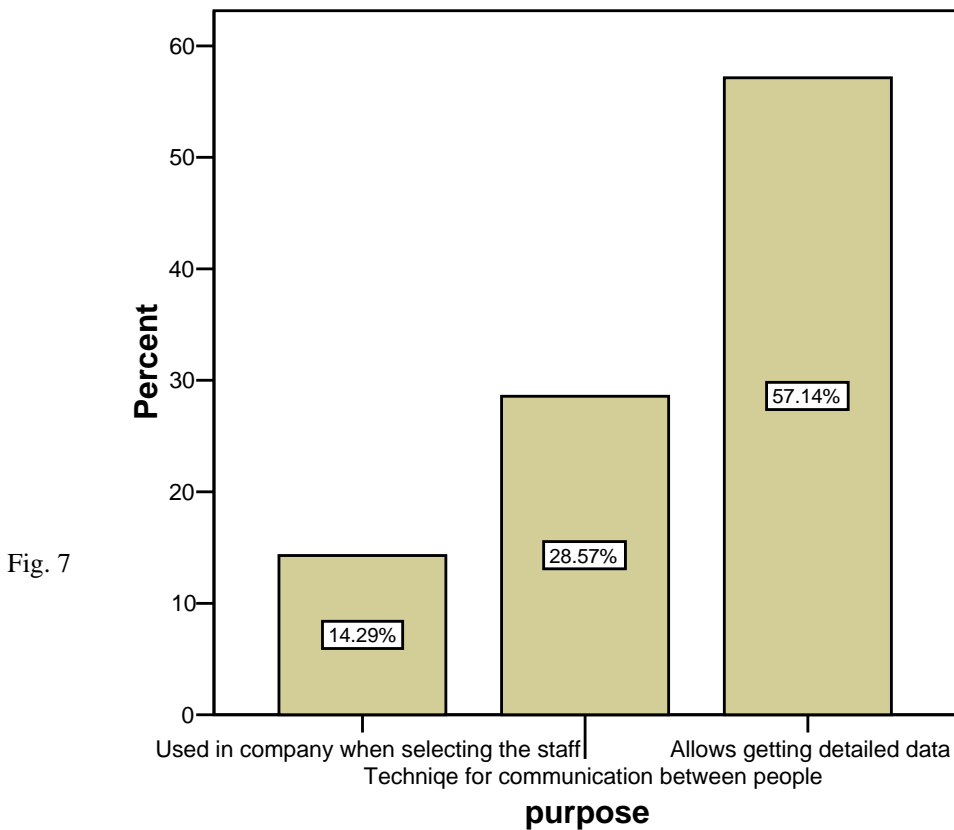
		purpose	kinds of interviews
N	Valid	7	5
	Missing	0	2

Table 3

purpose

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Used in company when selecting the staff	1	14.3	14.3	14.3
	Techniqe for communication between people	2	28.6	28.6	42.9
	Allows getting detailed data	4	57.1	57.1	100.0
	Total	7	100.0	100.0	

Table 4



kinds of interviews

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	interviewing and communication	1	14.3	20.0	20.0
	interviewing and questionnaire	1	14.3	20.0	40.0
	structured	2	28.6	40.0	80.0
	non structured	1	14.3	20.0	100.0
	Total	5	71.4	100.0	
Missing	System	2	28.6		
Total		7	100.0		

Table 5

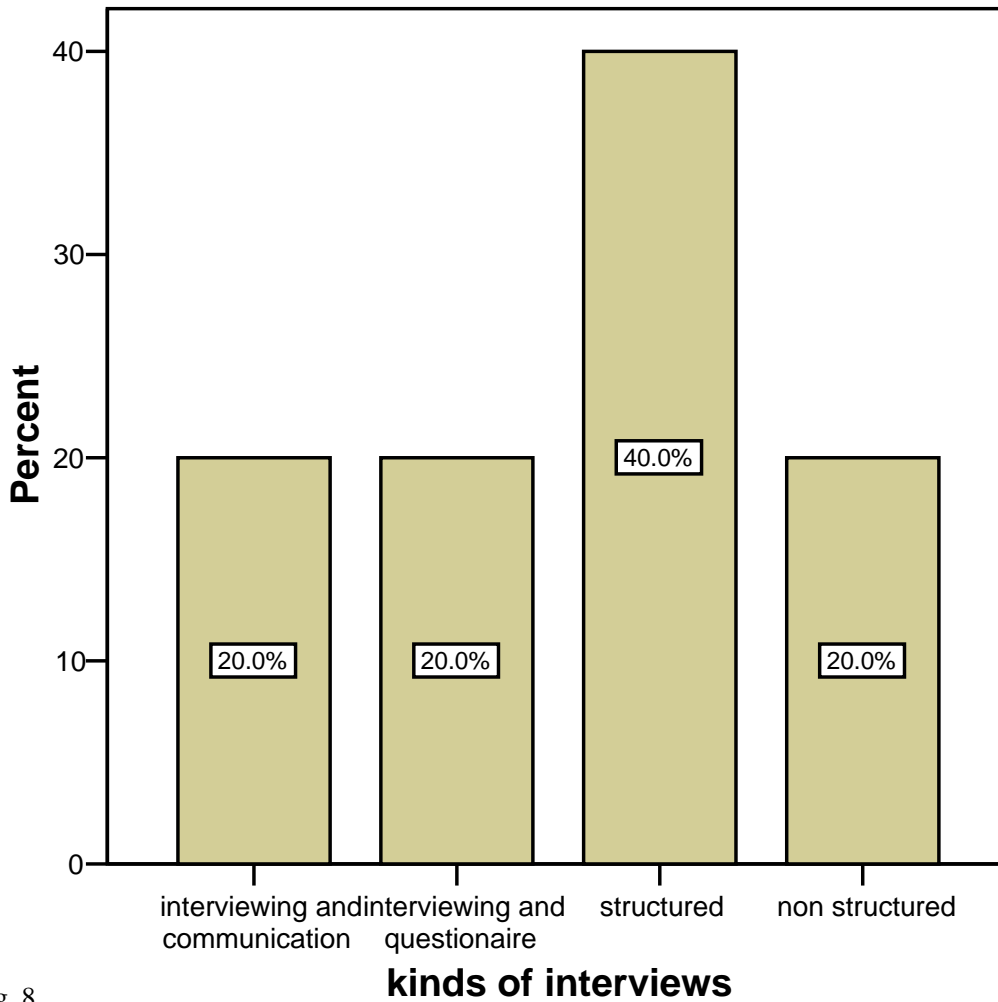


Fig. 8

Post – Model:

Statistics

		purpose	kinds of interviews	content
N	Valid	2	4	2
	Missing	5	3	5

Table 6

purpose

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Allows getting detailed data	2	28.6	100.0	100.0
Missing	System	5	71.4		
Total		7	100.0		

Table 7

Table 5

purpose

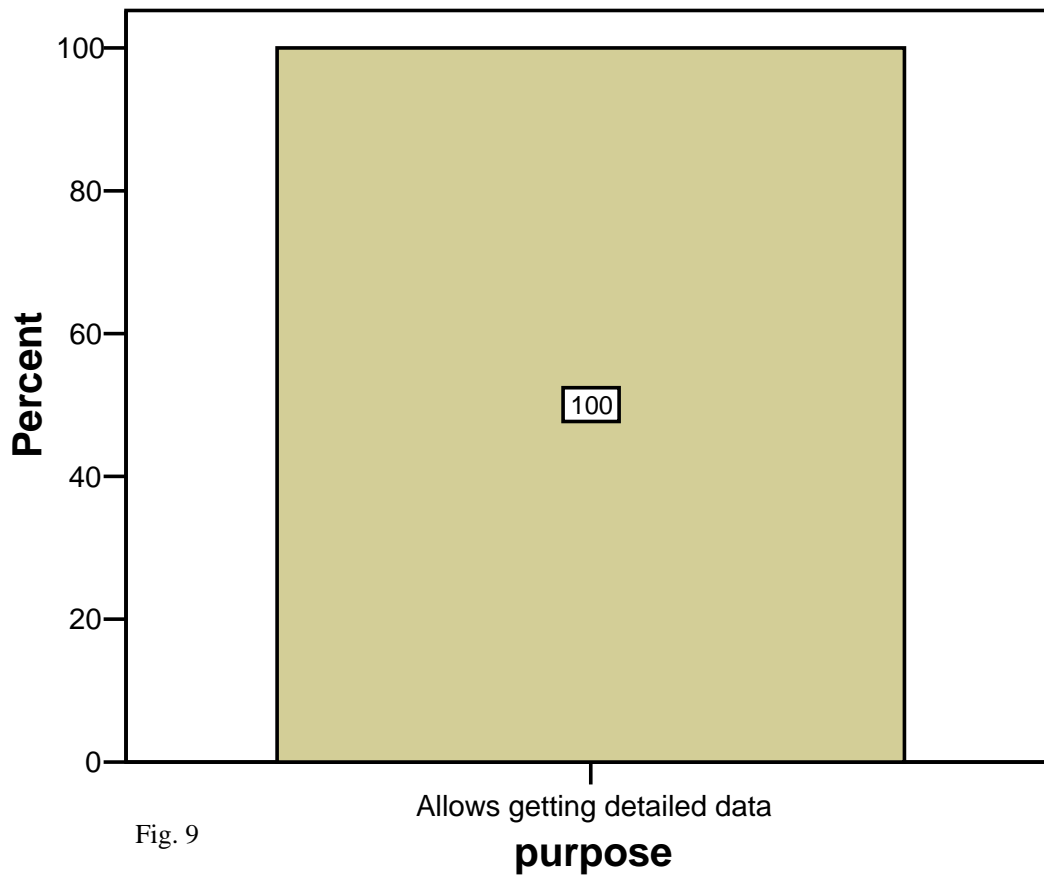


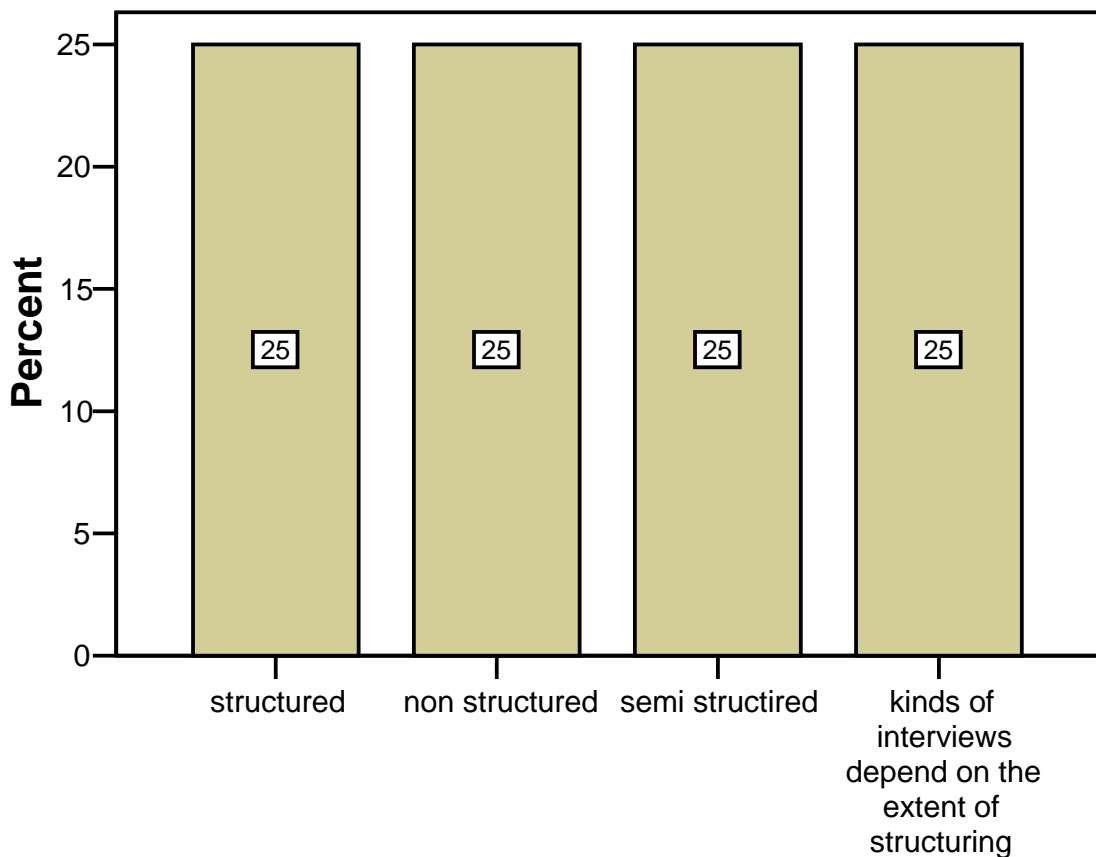
Fig. 9

kinds of interviews

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	structured	1	14.3	25.0	25.0
	non structured	1	14.3	25.0	50.0
	semi structured	1	14.3	25.0	75.0
	kinds of interviews depend on the extent of structuring	1	14.3	25.0	100.0
	Total	4	57.1	100.0	
Missing	System	3	42.9		
Total		7	100.0		

Table 8

kinds of interviews



kinds of interviews

Fig. 10

content

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	content of the questions is difficult to control	1	14.3	50.0	50.0
	warding plays role	1	14.3	50.0	100.0
	Total	2	28.6	100.0	
Missing	System	5	71.4		
Total		7	100.0		

Table 9

content

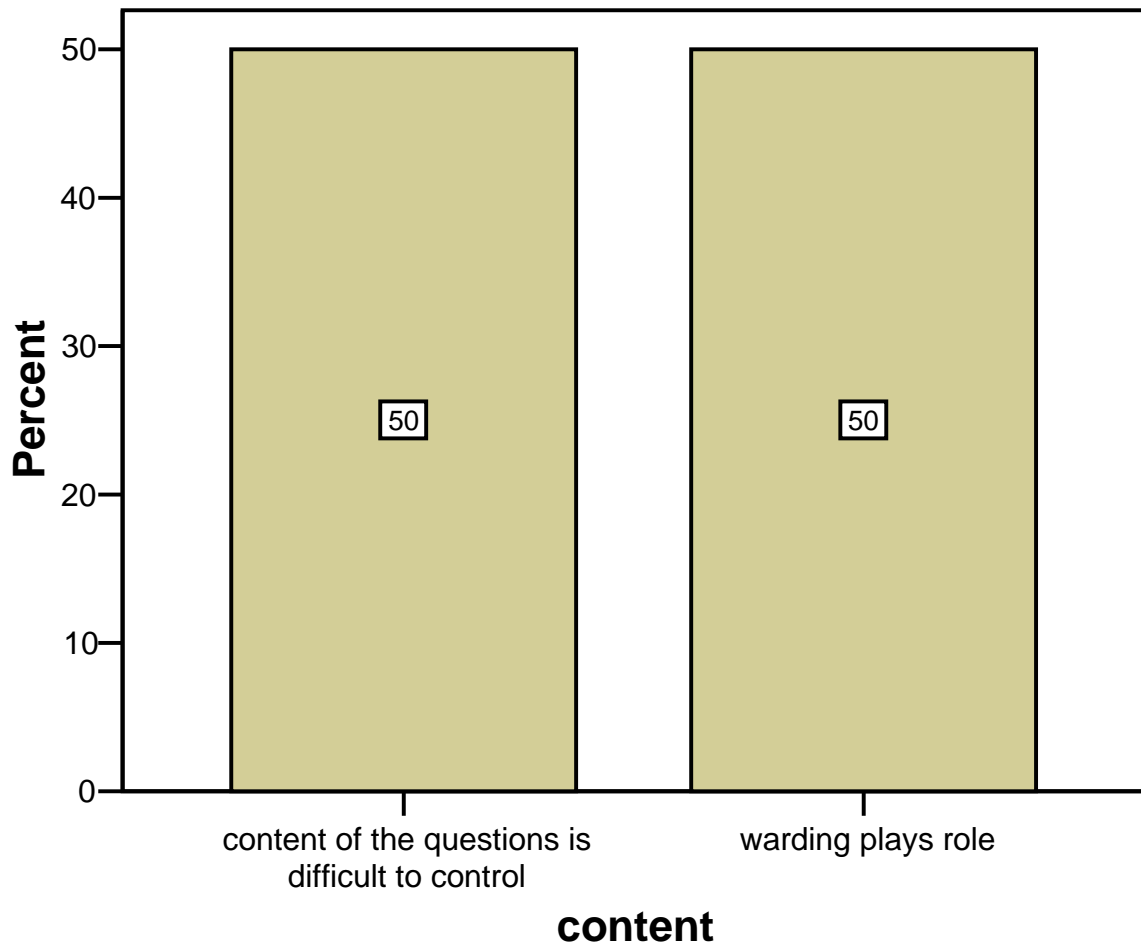


Fig. 11

7.5 Summary:

- i. After the presentation the dynamic and details complexity have increased (See page 9 point 5.4.2).
- ii. The Post-Model shows more “unintended” items (not included in the content of presentation), which means that the presentation “provoked” the participants.
- iii. The Post-model shows intended (included in the presentation) changes (new category *content*), and subcategory *semi structured interviews*, but the change is not so significant, it was just a small correction. Probably it is so because:
 - The experiment was made in a very small scale and short time given to participants for “writing the story”- future data source, was short, and a short time assigned for the task.
 - stimulus was the “presentation” (a one way communication technique), that make the role of participants very passive might have caused this small improvement in Mental Models. Maybe if the technique employed was more interactive the change in Mental Model would have been different.
- iv. The important result is that the number of “wrong answers” (wrong from the viewpoint of experts) decreased.
- v. No statistical analysis was performed because of it was pointless to do with such small (N=4) number of participants.

8. Conclusion

The existing approaches made available for evaluating the participatory processes tend to be often concentrated on: process itself, or the outcomes of the process. Still there remains a large gap between the two distinct focuses on how so called “in process” variables affect the outcomes of the processes. The important issue of evaluation in the context of community-based earthquake disaster management it to evaluate *preparedness* by measuring the change in awareness and behavior. The Mental Model approach for risk communication may serve as an effective tool to map and measure the change, (or lack of it) caused by actions (workshops etc.) it is expected also to be useful for mapping local/indigenous knowledge.

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コミュニティレベルの地震防災における参加型アプローチの有効性に関する検討とその評価法に関する研究

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要旨

本稿では、いくつかの参加型アプローチについて、コミュニティにおける地震防災を対象としたときの有効性について検討する。まず、防災計画の特殊性から既往の参加型アプローチが直接に適用できないことを指摘する。次に、参加型アプローチが複数主体の知識共有として表されることを示し、メンタルモデルに基づいた災害に対する備えの能力（preparedness）のマッピングと計量化の適用可能性について検討する。

キーワード：参加，リスクコミュニケーション，コミュニティ防災，メンタルモデル

