# Concept Mapping Workshop: Tasmanian Community Group

Project C7 (Development of an Evaluation Framework for Community Safety Policy and Programs for Bushfire) team members:

- Associate Professor Gerald Elsworth
- Alan Rhodes
- Helen Goodman
- Karl Anthony-Harvey-Beavis
- Roy Batterham (Consultant)

© Bushfire CRC Ltd 2005

Concept mapping workshops have been held across Australia with the aim of eliciting the views of fire agency personnel and community members on what changes and improvements should occur to make residents and their neighbourhoods safer from bushfires. The Project C7 team thanks all who participated in these workshops.

# Concept Mapping: Method

## The Overall Concept Mapping Process

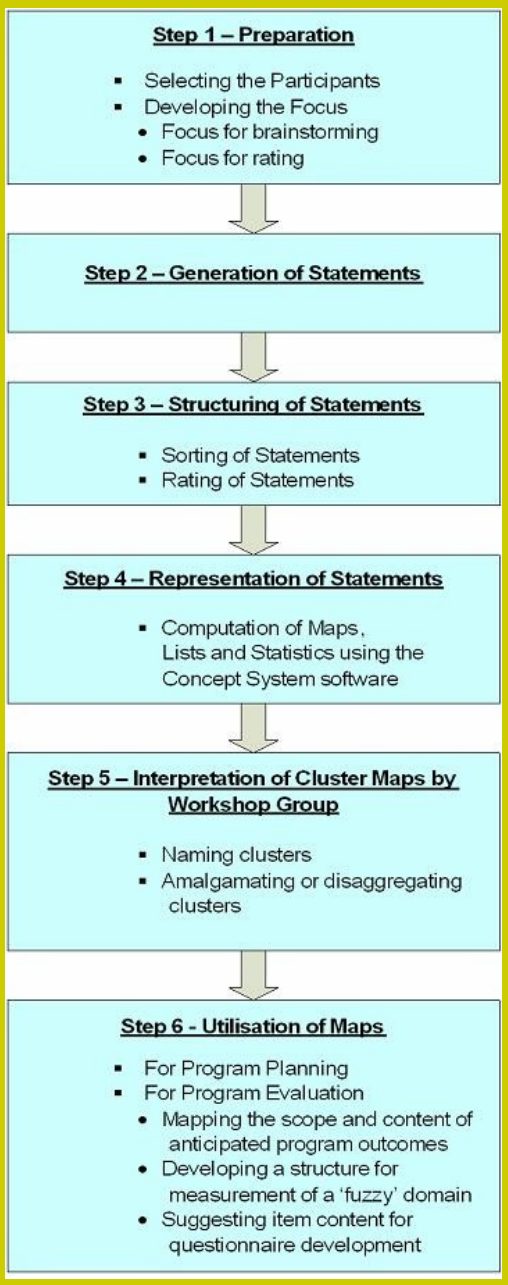



**Chart 1**

## How Your Concept Map was Created

- The researchers involved in project C7 used a technique known as 'concept mapping' to identify outcomes for bushfire safety policies and programs that stakeholders consider important. The particular method of concept mapping used was developed by William M.K. Trochim of Cornell University. Trochim's concept mapping process, as it relates to the workshop conducted with members of the Blue Mountains community is outlined below.

- Step 1: Eight community members from the town of Fern Tree were invited to attend a concept mapping workshop. The workshop took place at the local TSF fire station.

- Step 2: Participants were asked to brainstorm ideas in response to the statement 'Thinking as broadly as possible, generate statements that describe specific changes or improvements you think need to be achieved to make households and neighbourhoods safer from bushfires'.

- Step 3: Participants sorted all statements in a way that made sense to them as well as rating (on a scale of 1 to 5) each statement for its importance and difficulty of implementing it.

- Step 4: Computer assisted analysis of the sorted statements (multi-dimensional scaling and cluster analysis) produced a representation of how each statement related to all others (the Concept Map). Clusters of statements that had similar ideas were formed.

- Step 5: Participants were asked to individually name each cluster of statements. This was followed by a group discussion where consensus was reached on cluster names as well as highlighting any changes the participants felt should be made to the concept map.

**Here is the statement list your group generated:**

1. Awareness of fire prevention issues (eg. People as aware as they were after the Canberra fires every summer)
2. Need to involve as many people in the community as possible in fire safety and prevention (eg. Part-time owners, individual properties that are hazards)
3. Fire guard groups (support for each other, know each other, plan together)
4. Absentee landowners maintain their properties in a fire safe way
5. Residents have a process to get nearby 'unsafe' properties adequately prepared
6. People living on their own are supported (have contacts) in the event of a fire
7. People are made aware of the importance of keeping boundaries clear from undergrowth
8. Set the correct motivational environment - keep it as a high priority issue in the hierarchy of domestic issues
9. People/households have reasonable defendable zones around the house ('passive protection')
10. People have an awareness of how serious or non-serious a specific fire event is likely to be (eg. Can be affected by wind conditions)
11. People understand what is best to do in particular circumstances (whether to stay or go)
12. People understand who has the authority to issue directives in the case of a fire
13. People receive adequate information/communication in the event of a fire
14. Regular, funded program of hazard reduction (consistent funding, planned, uses best science)
15. Identification of particular geographical areas requiring extra risk management (partly based on past experience)
16. Effective clearance of debris (not just left in piles)
17. Better systems to let individual households know when and how it is ok to burn off
18. People are made aware of the need to remove combustible material from around the house
19. Development of best practice preparation plan by individual households
20. People are supported in understanding what risks and preparations are most relevant to their property
21. Some individualised advice on preparations by experienced persons
22. People understand how to protect themselves personally (ie protect your body) - eg. Appropriate clothes
23. Have appropriate clothing ready at hand
24. People need to be helped to prioritise fire preparations (eg. Cost benefit)
25. People have information on how fires generally behave (but not so that people have false confidence or are too panicked)
26. People have a good understanding and have made a decision to either prepare and stay or go early
27. People who are new to fire prone areas are made aware of need for a fire plan
28. People living in close proximity need to know about each others plans
29. People with limited capacity need to be able to ring someone and should be known to their fire guard group
30. People know safe routes to leave by if they are going to leave
31. Recognition of people's preparation endeavours (eg. A safe house)
32. People have a place to leave their car
33. Safe places for people to go
34. Water management preparation - water supplies at community and household level
35. Councils need to have consistent positions in relation to fire safety issues (eg. Fire safety and tree management)
36. Councils communicate information about requirements in timely, supportive (rather than legalistic) ways
37. Streamlined process for getting consistent household assessments and to help people meet requirements
38. People understand how they can help the fire service help them
39. All people need to know about and have access to local neighbourhood network (eg. Fire guard)
40. People are aware of wiring and power line issues that may cause fires and how to get them addressed
41. People know what to do when power lines are down
42. People have reliable information about the merits of different plant species

# An Explanation of the Workshop

The initial stage of the computer assisted analysis uses a technique known as multi-dimensional scaling. The concept map is constructed by amalgamating the sorted statements of each participant. Each point (statement) is positioned on the map in relation to all the others, with statements sorted together by more participants (similar in meaning) appearing closer together and those that were not sorted together (dissimilar in meaning) being further apart. In order to represent the concept map in a way that makes sense the Concept System program creates a two dimensional graphic (Map 1). This is necessary, because, to show exactly how the statements relate to each other would require the number of dimensions equal to the number of statements minus one. For example 42 statements means 41 dimensions would be required to present the data precisely. While presenting data in two dimensions makes it easier to understand and interpret, distortions can occur.

Following the multi-dimensional scaling an additional analysis is conducted to form clusters (Map 2). The Concept System program groups statements that are close together (have a similar meaning). For example, cluster 2 consists of statements 7, 16 and 18. Participants, individually, then as a group name each cluster based on what they believe to be the common theme in each of the statements making up the cluster. To continue with the earlier example, all the statements in cluster 2 were concerned with hazard reduction. Thus, it was decided that an appropriate name for the cluster would be 'Clearing (hazard reduction)'.

In addition to naming individual clusters, participants identified four groupings of clusters that were related. Clusters 2, 3 and 4 were concerned with the management of hazards throughout the environment. Clusters 1 and 7 were related to the provision of support to households. Clusters 6 and 8 dealt with issues relating to neighbourhood networks. Finally participants felt cluster 8 also had links with cluster 9, in that they both focused on what people should do when threatened by bushfire. The identification of these broad themes and the more specific cluster names will provide a starting point for the researchers to ascertain the importance of various interventions.

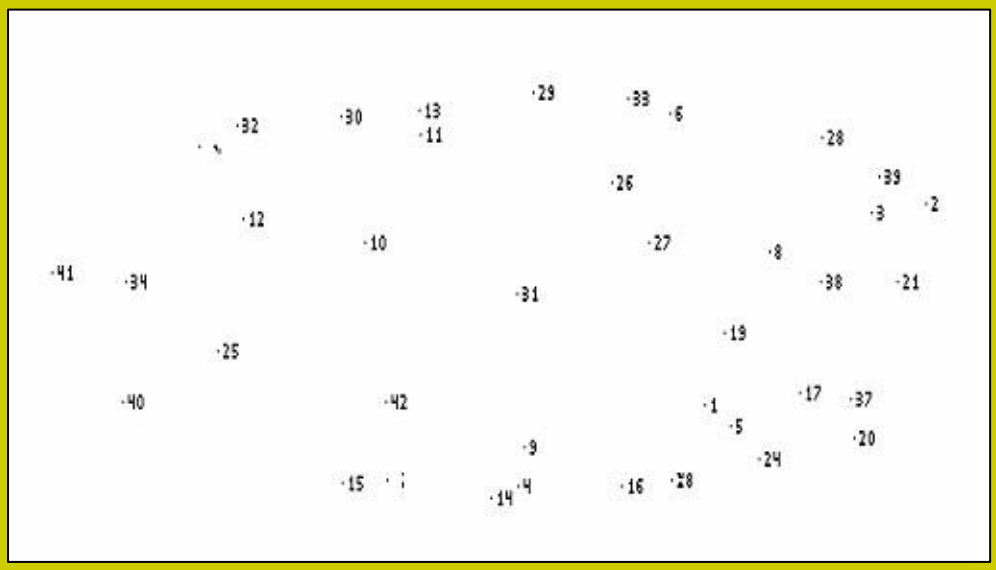
It is important to recognise that cluster analysis is not as robust a process as multi-dimensional scaling. As there is no one, 'correct' method used to determine the number of clusters, or which points belong in which cluster (the Concept Systems program starts with approximately the number of clusters equal to 1/5 of the number of statements). For this reason, an important step in the construction of a concept map is for participants to have the opportunity to change parts of the map with which they do not agree.

The following is a summary of the changes participants in the Tasmanian Community Group workshop believed should be made:

- Statement 14 : from cluster 3 to cluster 4;
- Statement 25: from cluster 5 to cluster 9.

In addition to these changes, participants felt the issues relating to the resourcing of brigades, management of recovery/follow-up and education of householders were not represented on the concept map.

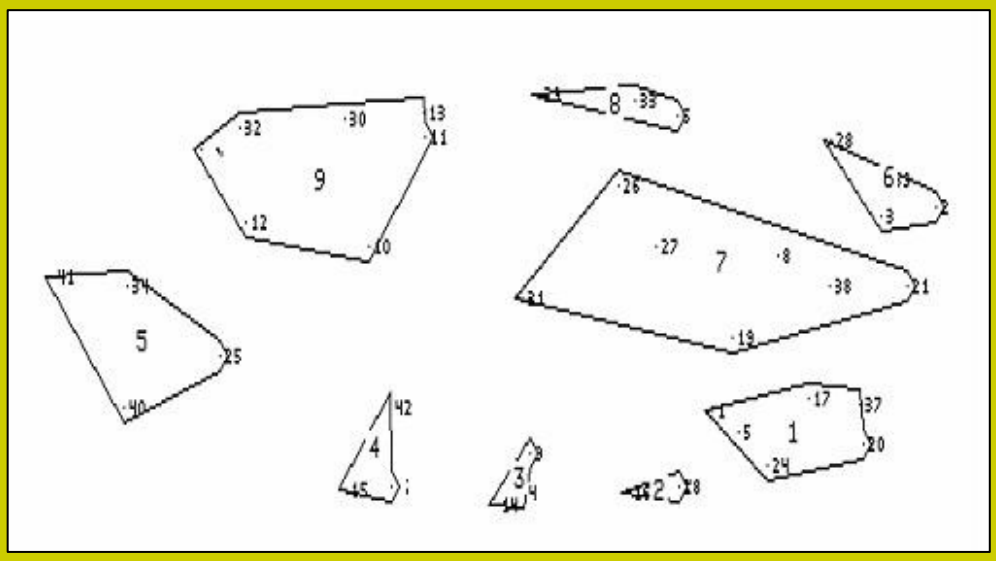
# The Concept Maps Generated During the Workshop



**Map 1**

### Cluster Names

- Cluster 1: Assistance in preparation of properties (awareness and education)
- Cluster 2: Clearing (hazard reduction)
- Cluster 3: Household fuel management
- Cluster 4: Area hazard management
- Cluster 5: Utilities
- Cluster 6: Neighbourhood networks and support
- Cluster 7: Guidance to household (personalised)
- Cluster 8: support for individuals (particular needs)
- Cluster 9: On the day (understanding what to do)



**Map 2**

# The generation of 3-dimensional concept maps

Following the concept mapping workshop, the researchers used the raw data that had been collected to gain a greater understanding of what community members and agency personnel believe is important to improve bushfire safety.

The researchers used a program developed by David Wishart of St. Andrews University to analyse the data. Clustan™ allows data to be presented in three dimensions, producing a more accurate representation of how the statements are related to each other than a two dimensional concept map.

After the three-dimensional concept maps had been produced the researchers named the clusters and dimensions (where possible broad themes were identified at each of the x and y axes), using the same process as that in the workshop. That is, each researcher named the clusters and dimensions, then as a group consensus was reached.

After three-dimensional concept maps had been constructed for each workshop (eleven in total) a broad range of themes related to community safety outcomes were identified. To identify and clarify these themes the researchers, as a group, sorted the pool of cluster names from individual workshops according to the similarity of the ideas represented in each. This enabled a combined solution of all the workshops to be formed.

As with the 2-dimensional concept map, broad themes were identified in the 3-dimensional maps. They were:

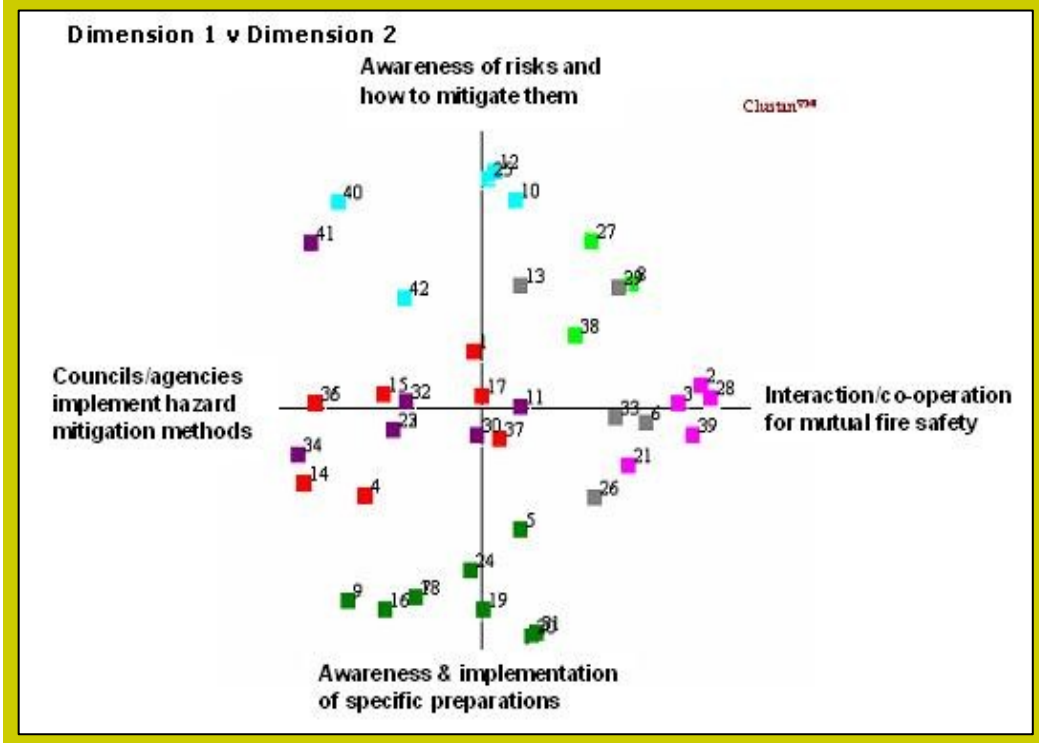
- Dimension 1 (right: Maps 3 & 4): Interaction/co-operation for mutual fire safety
- Dimension 1 (left: Maps 3 & 4): Councils/ Agencies implement hazard mitigation methods
- Dimension 2 (top: Map 3): Awareness of risks and how to mitigate them
- Dimension 2 (bottom: Map 3): Awareness and implementation of specific preparations
- Dimension 3 (top: Map 4): Planning for ‘Stay or Go’
- Dimension 3 (bottom: Map 4): Agencies/ governments have systems in place to facilitate preparation

The dimensions are an amalgamation of a number of clusters and statements. They represent the high-level or overarching ideas that are important when trying to make communities safer from bushfire. The clusters and statements can be seen as different aspects of the more general themes, whether they are the identification of an important outcome or the means of implementing that outcome. The dimensions can be seen in terms of processes and outcomes. For example an ‘Awareness and implementation of specific preparations’ is one process whereby the outcome of ‘Planning for ‘Stay or Go’’ can be achieved.

Beginning with these broad categories and working back down to the individual statements, it is hoped participants and researchers will gain a clearer understanding of what they believe will help improve community safety programs for bushfire.

## Cluster Names

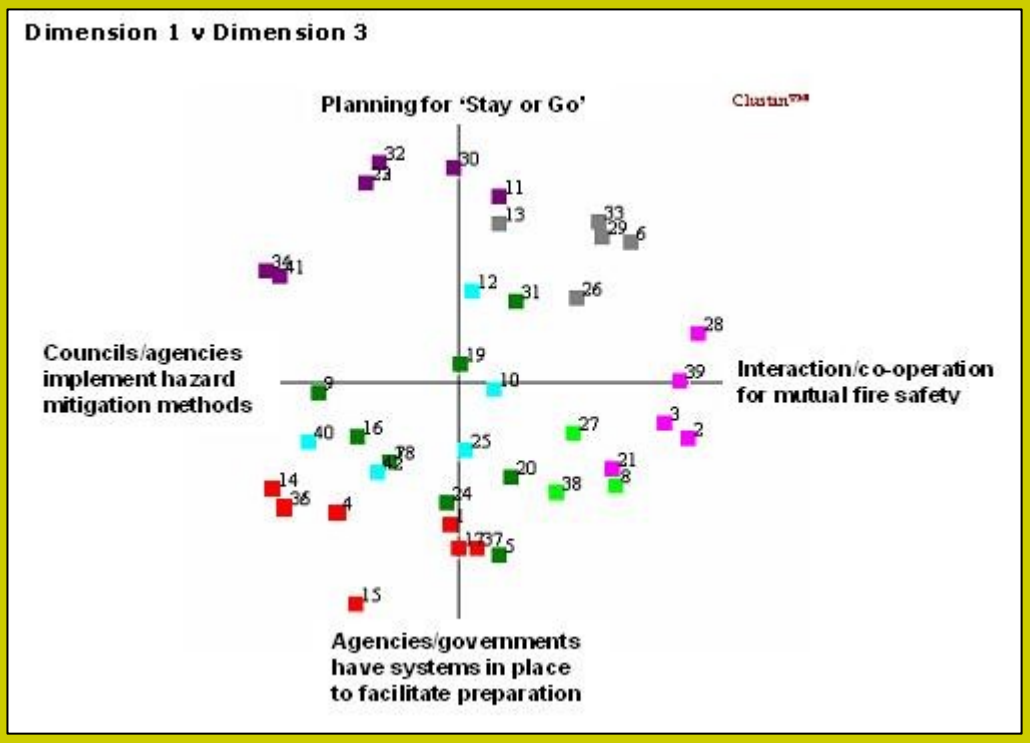
- Cluster 1 (Statements 1, 15, 17, 37, 4, 14, 35 & 36 : Identification and management of risk areas with appropriate regulatory systems
- Cluster 2 (Statements 5, 7, 9, 16, 18, 19, 20, 24 & 31): Awareness of how to prepare
- Cluster 3 (Statements: 2, 3, 21, 28 & 39): Community interaction/co-operation for mutual fire safety
- Cluster 4 (Statements 8, 27 & 38): Raising awareness of the need to prepare




Map 3

# 3-Dimensional Concept Maps

- Cluster 5 (Statements 10, 12, 25, 40 & 42): Identifying risk factors during a fire
- Cluster 6 (Statements 6, 13, 26 & 29): Support for individuals (particular needs)
- Cluster 7 (Statements 11, 22, 23, 30, 32, 34 & 41): People have appropriate plans




Map 4

# Importance and Difficulty Ratings

During the workshop participants were asked to rate, on a five point scale, each statement for its importance (in making people and neighbourhoods safer from bushfire) and the difficulty of implementing the changes or improvements suggested by those taking part. Following the workshop the mean importance and difficulty for each statement was calculated. This data was sorted and the mean calculated for each cluster.

The means for each cluster were entered into an SPSS spreadsheet and a scatterplot showing importance by difficulty was created for both the two and three dimensional solutions (Chart 2 and 3 respectively).

The scatterplots allow the researchers to identify actions or ideas that could be used as a starting point in community safety programs. Clusters in the top left-hand corner of the scatterplot are perceived as important in making people safer from bushfire while being relatively simple to implement.

In relation to the planning and implementation of community safety programs for bushfire the scatterplots raise some interesting questions. For example, do current programs address those areas that community members feel are important? Are community members focusing on unimportant or less important areas of bushfire safety? Are these messages reaching the whole community, or only sections? What role has bushfire education played in supporting or creating these perceptions? And if community members are focusing on the 'right' messages are they putting them into practice?

When using the 'importance by difficulty' scatterplots, whether it be for planning or as an aid to facilitate discussion, it is important to keep in mind that the cluster analysis gives different results for the two and three dimensional solutions. This means that while clusters may have similar names, it is likely that the statements that make up the clusters will differ. For this reason, the two should not be directly compared.

Finally, it should be emphasised that academic arguments about the merits of one solution over the other should not limit any discussion. If it is felt one scatterplot provides better or more interesting results for a particular purpose, then that one should be used.

# Importance by Difficulty Based on the 2-Dimensional Concept Map

### Cluster Names Derived from the Two-Dimensional Concept Map

Cluster 1: Assistance in preparation of properties (awareness and education)

Cluster 2: Clearing (hazard reduction)

Cluster 3: Household fuel management

Cluster 4: Area hazard management

Cluster 5: Utilities

Cluster 6: Neighbourhood networks and support

Cluster 7: Guidance to household (personalised)

Cluster 8: support for individuals (particular needs)

Cluster 9: On the day (understanding what to do)

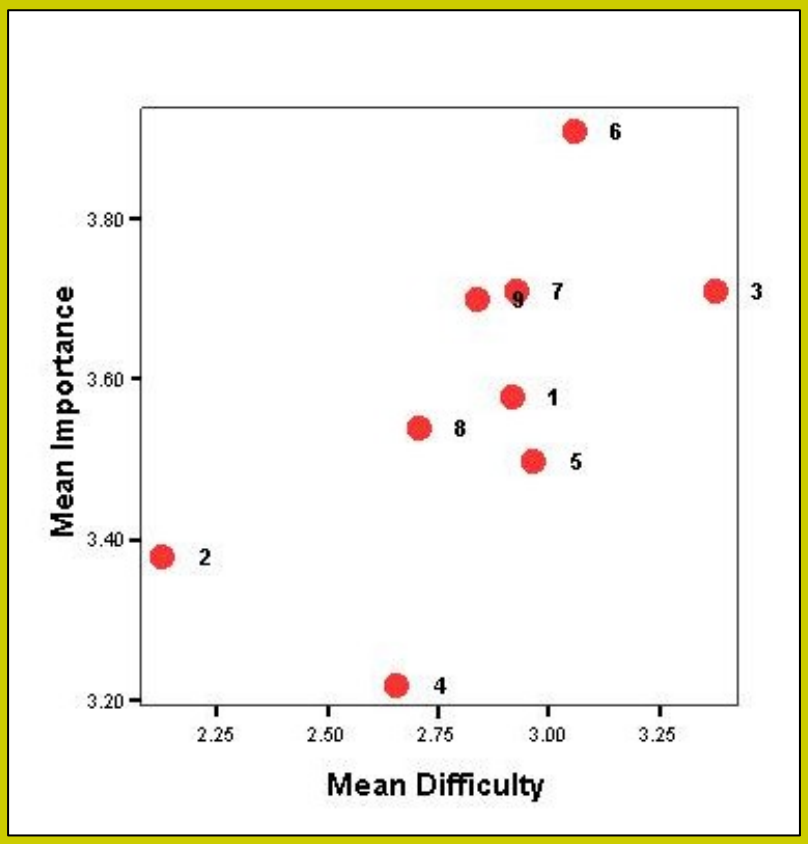



**Chart 2**

| Cluster No. | Mean Imp. | Mean Diff.2.5 |
|---|---|---|
| 1 | 3.6 | 2.9 |
| 2 | 3.4 | 2.1 |
| 3 | 3.7 | 3.4 |
| 4 | 3.2 | 2.7 |
| 5 | 3.5 | 3.0 |
| 6 | 3.9 | 3.1 |
| 7 | 3.7 | 2.9 |
| 8 | 3.5 | 2.7 |
| 9 | 3.7 | 2.8 |

| Importance Scale | |
|---|---|
| 1 | Unimportant |
| 2 | A little important |
| 3 | Moderately important |
| 4 | Very important |
| 5 | Essential |

| Difficulty Scale | |
|---|---|
| 1 | Very easy or already achieved |
| 2 | Not difficult |
| 3 | Moderately difficult |
| 4 | Very difficult |
| 5 | Extremely difficult |

# Importance by Difficulty Based on the 3-Dimensional Concept Map

### Cluster Names Derived from the Three-Dimensional Concept Map

Cluster 1: Identification and management of risk areas with appropriate regulatory systems

Cluster 2: Awareness of how to prepare

Cluster 3: Community interaction/co-operation for mutual fire safety

Cluster 4: Raising awareness of the need to prepare

Cluster 5: Identifying risk factors during a fire

Cluster 6: Support for individuals (particular needs)

Cluster 7: People have appropriate plans

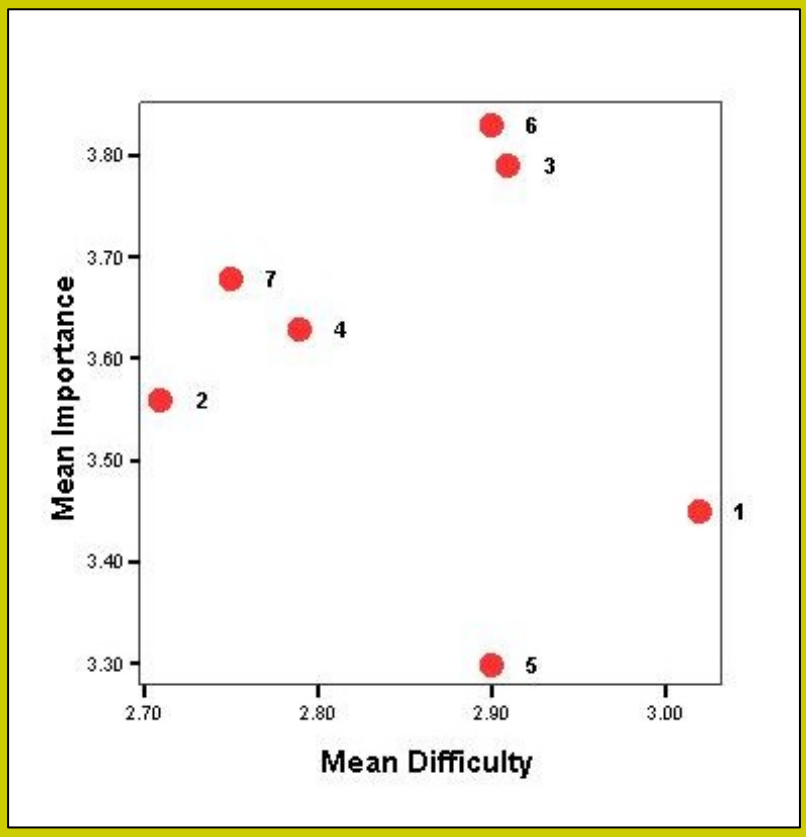



**Chart 3**

| Cluster No. | Mean Imp. | Mean Diff. |
|---|---|---|
| 1 | 3.5 | 3.0 |
| 2 | 3.6 | 2.7 |
| 3 | 3.8 | 2.9 |
| 4 | 3.6 | 2.8 |
| 5 | 3.3 | 2.9 |
| 6 | 3.8 | 2.9 |
| 7 | 3.7 | 2.8 |

| Importance Scale | |
|---|---|
| 1 | Unimportant |
| 2 | A little important |
| 3 | Moderately important |
| 4 | Very important |
| 5 | Essential |

| Difficulty Scale | |
|---|---|
| 1 | Very easy or already achieved |
| 2 | Not difficult |
| 3 | Moderately difficult |
| 4 | Very difficult |
| 5 | Extremely difficult |

# Statistically Significant Differences Between Clusters: 2 & 3-Dimensional Concept Maps

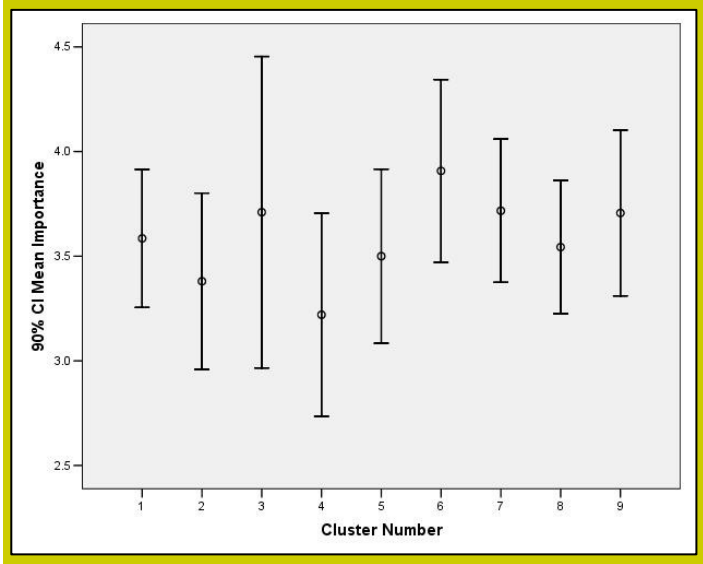



**Chart 4**

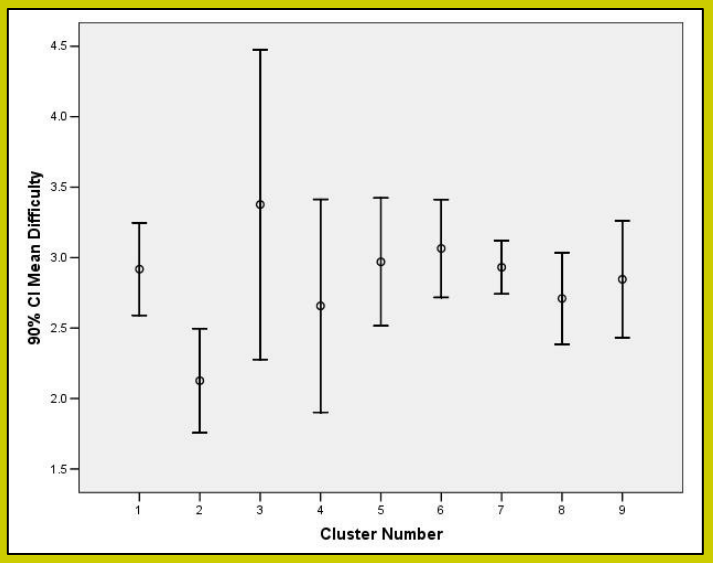



**Chart 5**

For both the two-dimensional (Chart 4 & 5) and three-dimensional (Chart 6 & 7) solutions the researchers used SPSS to create error bars for each cluster by importance and difficulty. Due to the low number of statements in each cluster, the confidence interval was lowered to 90% (rather than the customary 95%). The four charts give the researchers a further idea about how much the concepts that emerged during the workshop differ. For example, Chart 2 shows those who took part in this workshop believed cluster one (Assistance in preparation of properties (awareness and education) is more difficult than cluster two (Clearing (hazard reduction)) when making households and communities safer from bushfire. Chart 5 shows that this difference is statistically significant (if the error bars do not overlap the difference is statistically significant).

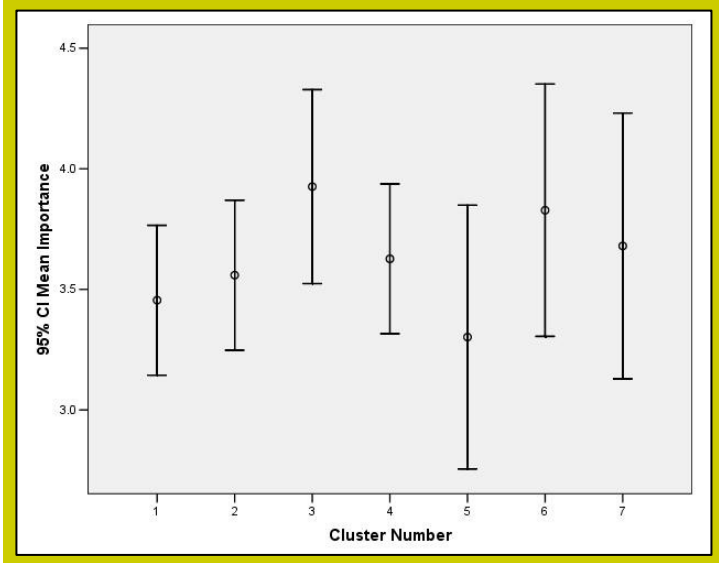



**Chart 6**

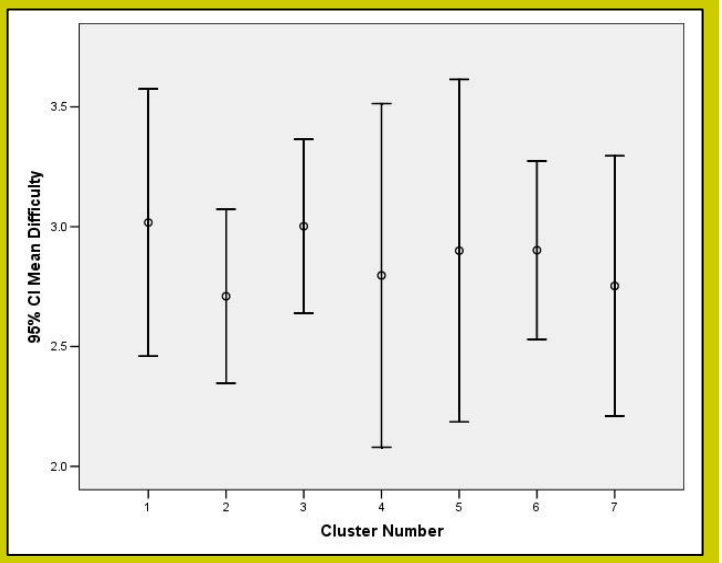



**Chart 7**