# Concept Mapping Workshop: Sheoaks

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Concept mapping workshops have been held across Australia with the aim of eliciting the views of fire agency personnel and community members views 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

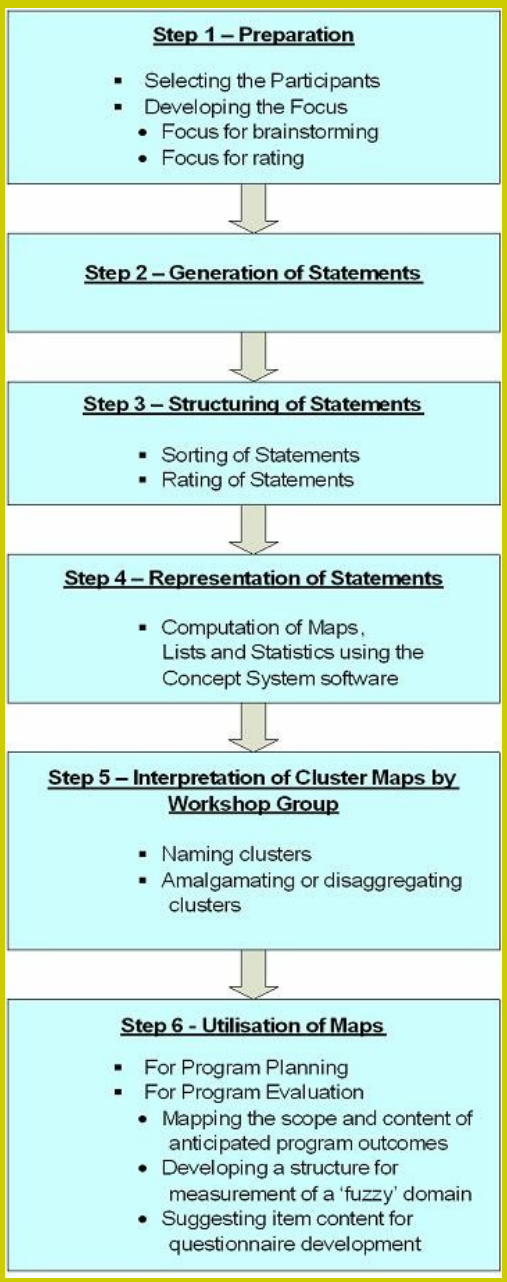



**Chart 1**

## 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: Nine community members from the area around the Brisbane Ranges were invited to attend a concept mapping workshop by the community safety officer. The workshop took place at one of the participants' homes.

- 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. More public education  to reach those who currently don't participate (eg mass media)
2. Residents get knowledge of what to do in case of fire
3. Residents have made a decision about whether to stay or go
4. Clear scrub from roadsides
5. Create clarity about what you are and aren't allowed to clear
6. Long term reduction of vulnerability to ember attack (roof sealing, sprinklers)
7. Individuals understand and accept responsibility for their own property
8. Suitable fuel reduction in national parks
9. Council planning requirements enshrine appropriate fire safety messages
10. More participation and acceptance of responsibility from relevant authorities (local government and state) eg sign on campground
11. Appropriate changes to building regulations ie sprinklers compulsory
12. Get a knowledge of what can and cannot be done (by-laws, regulations etc)  regarding roadside timber
13. Households implement short term preparation plan and revise it each season
14. Consider getting scanners to obtain fire information
15. Overall bush fuel reduction management plan covering state forests, national parks and private land
16. New residents encouraged to consider fire issues and local risks (and to join Community Fireguard groups)
17. Insurance discounts for those with good fire prevention measures, and penalties for those without
18. People need to be aware that they live in a high fire area (even before they buy)
19. Households have a fire plan prior to the fire danger period
20. Give people more control over their own property (so they can clear appropriately)
21. People provide appropriate access for fire trucks
22. Legislate against use of open fires in campsites in summer
23. Education of visiting and recreational users of the area (eg putting fires out thoroughly)
24. Improving communication between neighbours and knowledge of each others circumstances
25. All properties brought up to current clearance standards (not the standards at time it was built)
26. Properties checked that they provide safe access for fire vehicles (may need to be checked by local brigades)
27. CFA brigade members trained to deliver a consistent fire safety message to householders
28. Neighbours meet together to share information and knowledge and build confidence that they know what to do in case of fire
29. Better management of roadside reserves
30. Government to make example plans available to residents in fire prone areas
31. Install safe BBQs and BBQ areas in designated campsites
32. Improve local water resources
33. Effective communication between CFA and community during a fire (eg public broadcasts)
34. Amount of clearance required around houses to be defined or made compulsory
35. CFA conduct fuel reduction burning on private property in strategic areas
36. Contact made by existing Fireguard members with new people in the area
37. Any new power lines in the aea underground
38. CFA gets information about water sources and access points on each property (from local govt)
39. Fire levy part of rates rather than insurance (so that everyone pays it)
40. Known camping areas are regularly inspected by a ranger or designated person
41. More consideration given to community refuge points (and issues preventing this eg public liability)

# 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 41 statements means 40 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 1 consists of statements 1, 12 and 23. 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 1 were concerned with the education of community members. Thus, it was decided that an appropriate name for the cluster would be 'Education'.

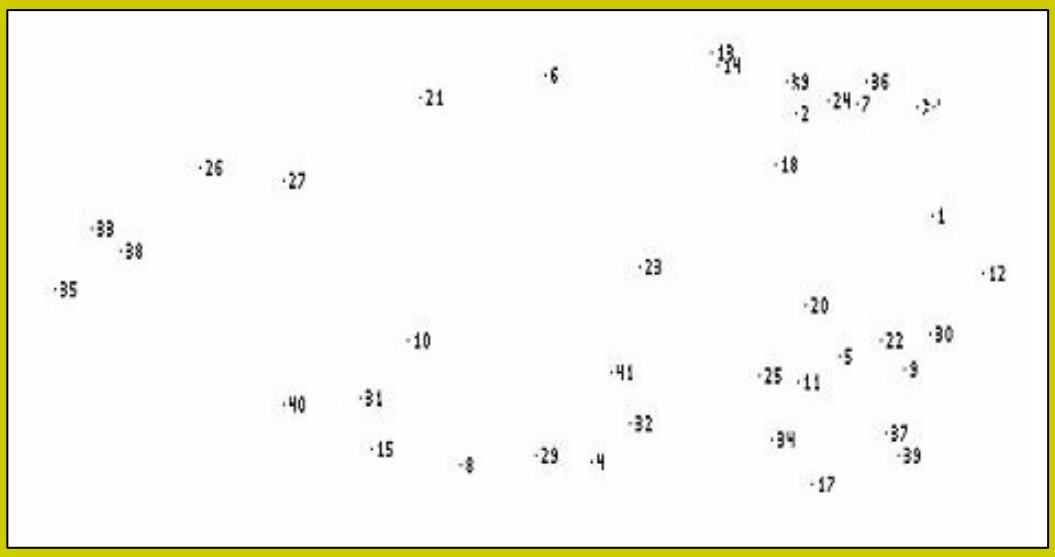
In addition to naming individual clusters, participants identified three groupings of clusters that were related. Clusters 1, 6 and 7 were concerned with education, awareness of the risks community members faced and appropriate behaviour to minimise those risks. Clusters 2, 3 and 4 were all related to government policy. Clusters 5 and 8 dealt issues relating to with local management. 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 Sheoaks Community Group workshop believed should be made:

- Statements 7, 16, 28 & 36 : from cluster 6 to form a new cluster;
- Remainder of cluster 6 and 7 joined together;
- Statements 17 & 39: from cluster 3 to form a new cluster;
- Statements 11, 25, 32, 34 & 41: from clusters 2 & 4 to form a new cluster.

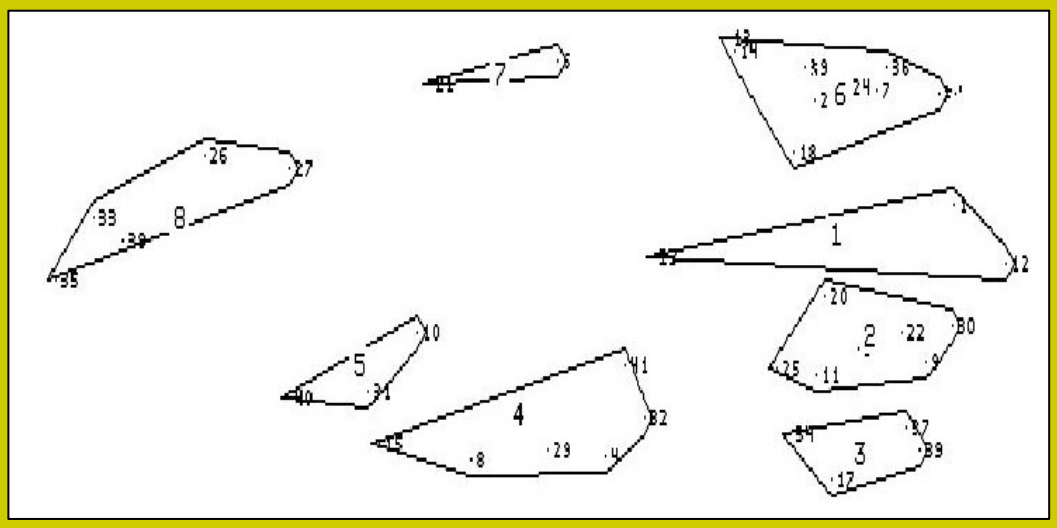
# The Concept Maps Generated During the Workshop



**Map 1**

## Cluster Names

- Cluster 1: Education
- Cluster 2: Local government regulation
- Cluster 3: Financial incentives
- Cluster 4: Risk management/fuel management
- Cluster 5: DSE and public facilities
- Cluster 6: Community connection
- Cluster 7: Behaviour, awareness and responsibility
- Cluster 8: CFA issues (CFA a driver




**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:

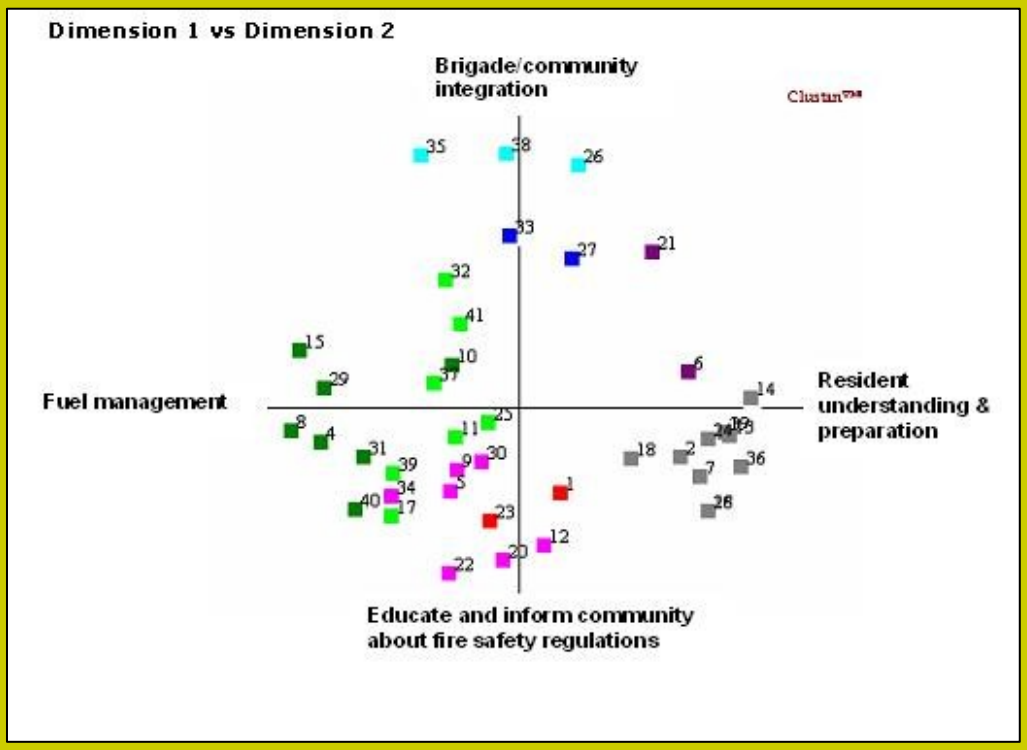
- Dimension 1 (right: Maps 3 & 4): Resident understanding and preparation
- Dimension 1 (left: Maps 3 & 4): Fuel management
- Dimension 2 (top: Map 3): Brigade/community integration
- Dimension 2 (bottom: Map 3): Educate and inform community about fire safety regulations
- Dimension 3 (top: Map 4): Agency/Government responsibilities
- Dimension 3 (bottom: Map 4): Regulation and infrastructure to support fire safety

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 a that outcome. The dimensions can be seen in terms of processes and outcomes. For example 'Effective communication and education' is one process whereby the outcome of 'Individual/household planning' 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

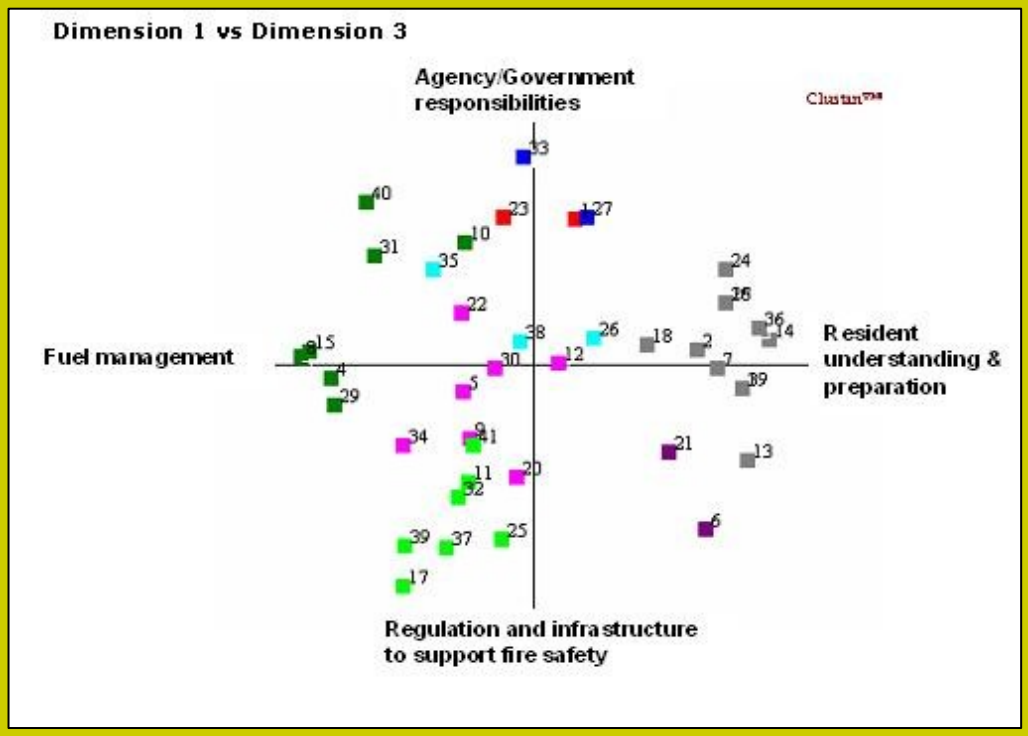
- Cluster 1 (Statements 1, 23: Education of the 'wider' community (those not participating and visitors)
- Cluster 2 (Statements 10, 15, 29, 31, 40 & 48): Practical agency/government responsibilities and actions on local issues (campers)
- Cluster 3 (Statements: 5, 9, 12, 20, 22, 30 & 34): Cluster 3: Understanding and application of regulations for fire safety
- Cluster 4 (Statements 11, 17, 25, 32, 37, 39 & 41): Agency/government use of regulations and incentives to improve preparedness of the setting




Map 3

# 3-Dimensional Concept Maps

- Cluster 5 (Statements 27, & 33): Dialogue between community and agencies
- Cluster 6 (Statements 2, 3, 7, 13, 14, 16, 18, 19, 24, 28 & 36): Residents understand and prepare/plan for bushfire
- Cluster 7 (Statements 6 & 21): Practical household planning and preparation
- Cluster 8: (Statements 26, 35 & 38): Agency preparation and actions




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 in the workshop. Following the workshop the mean importance and difficulty for each statement was calculated. These data were 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 (Chart 2) and three (Chart 3) dimensional solutions.

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: Education
- Cluster 2: Local government regulation
- Cluster 3: Financial incentives
- Cluster 4: Risk management/ fuel management
- Cluster 5: DSE and public facilities
- Cluster 6: Community connection
- Cluster 7: Behaviour, awareness and responsibility
- Cluster 8: CFA issues (CFA a driver)

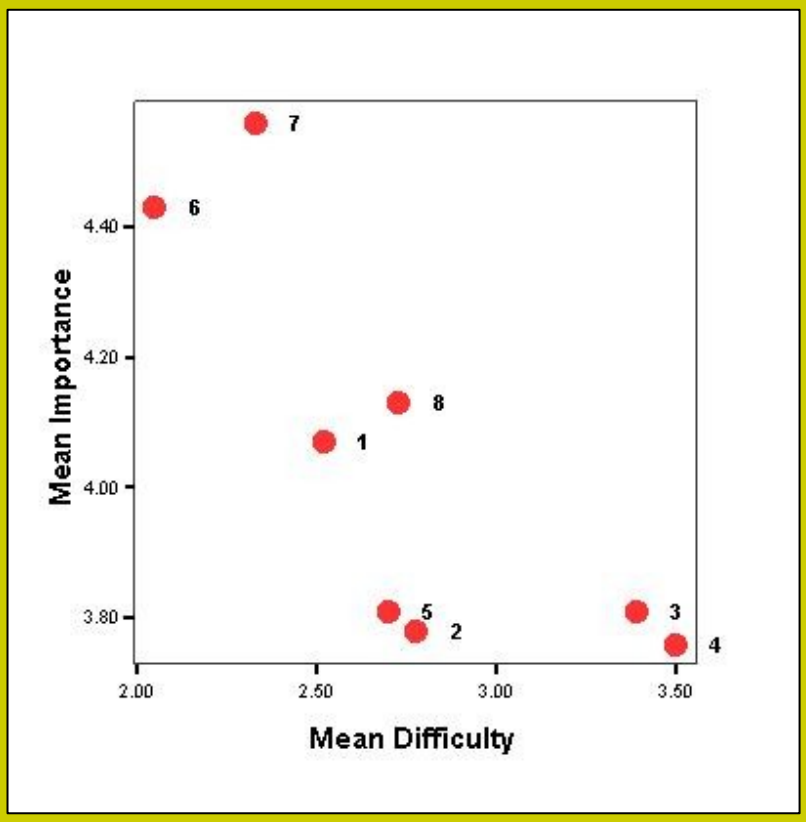



**Chart 2**

| Cluster No. | Mean Imp. | Mean Diff.2.5 |
|---|---|---|
| 1 | 4.1 | 2.5 |
| 2 | 3.8 | 2.8 |
| 3 | 3.8 | 3.4 |
| 4 | 3.8 | 3.5 |
| 5 | 3.8 | 2.7 |
| 6 | 4.4 | 2.1 |
| 7 | 4.6 | 2.3 |
| 8 | 4.1 | 2.7 |

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

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

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

- Cluster 1: Education of the 'wider' community (those not participating and visitors)
- Cluster 2: Practical agency/ government responsibilities and actions on local issues (campers)
- Cluster 3: Understanding and application of regulations for fire safety
- Cluster 4: Agency/government use of regulations and incentives to improve preparedness of the setting
- Cluster 5: Dialogue between community and agencies
- Cluster 6: Residents understand and prepare/plan for bushfire
- Cluster 7: Practical household planning and preparation
- Cluster 8: Agency preparation and actions

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

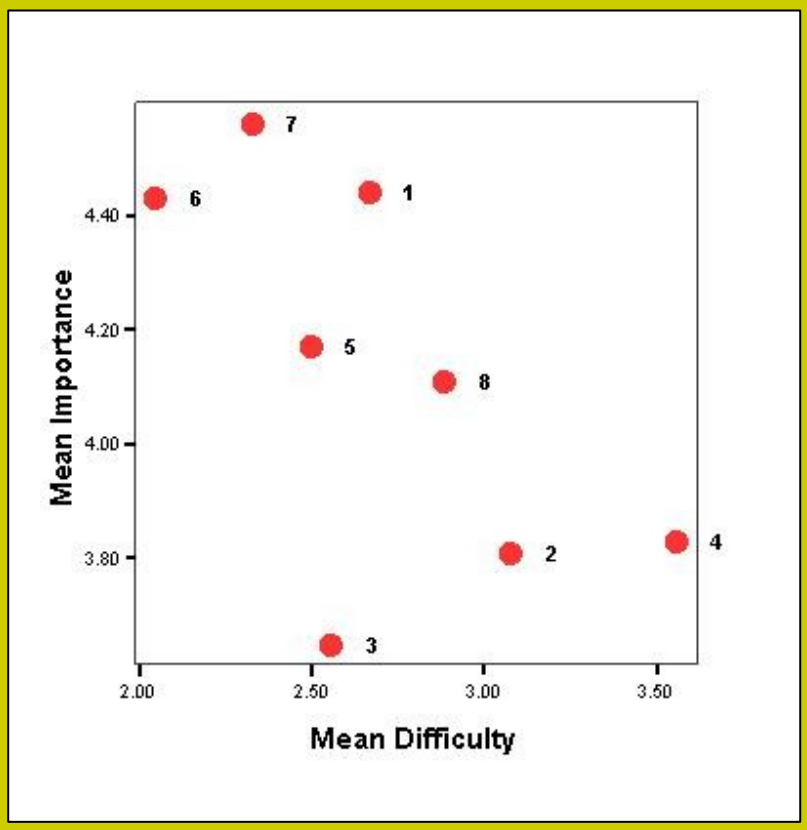



**Chart 3**

| Cluster No. | Mean Imp. | Mean Diff. |
|---|---|---|
| 1 | 4.4 | 2.7 |
| 2 | 3.8 | 3.1 |
| 3 | 3.7 | 2.6 |
| 4 | 3.8 | 3.6 |
| 5 | 4.2 | 2.5 |
| 6 | 4.4 | 2.1 |
| 7 | 4.6 | 2.3 |
| 8 | 4.1 | 2.9 |

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

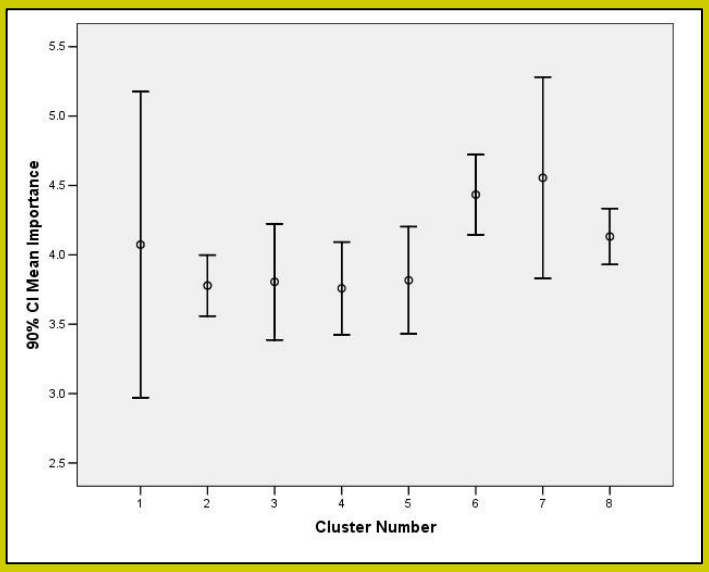



**Chart 4**

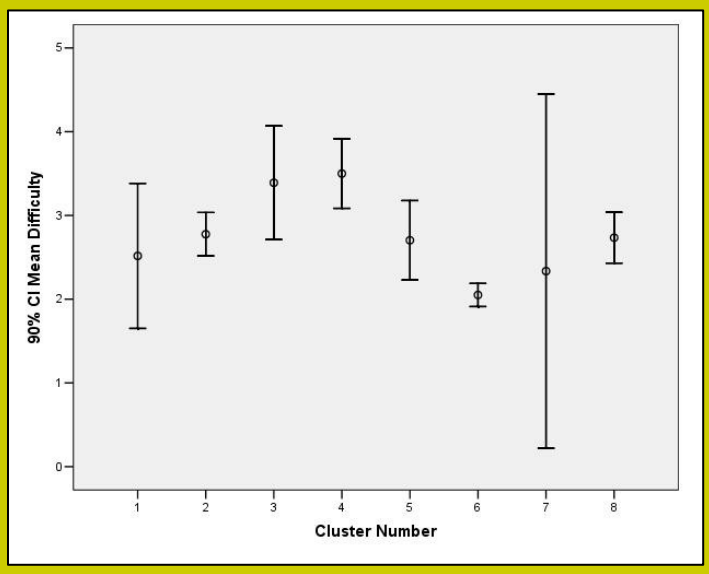



**Chart 5**

For both the two-dimensional (charts 4 & 5) and three-dimensional (charts 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 3 shows those who took part in this workshop believed cluster six (Residents understand and prepare/plan for bushfire) is more important than cluster three (Understanding and application of regulations for fire safety) when making households and communities safer from bushfire. Chart 6 shows that this difference is statistically significant (if the error bars do not overlap the difference is statistically significant).

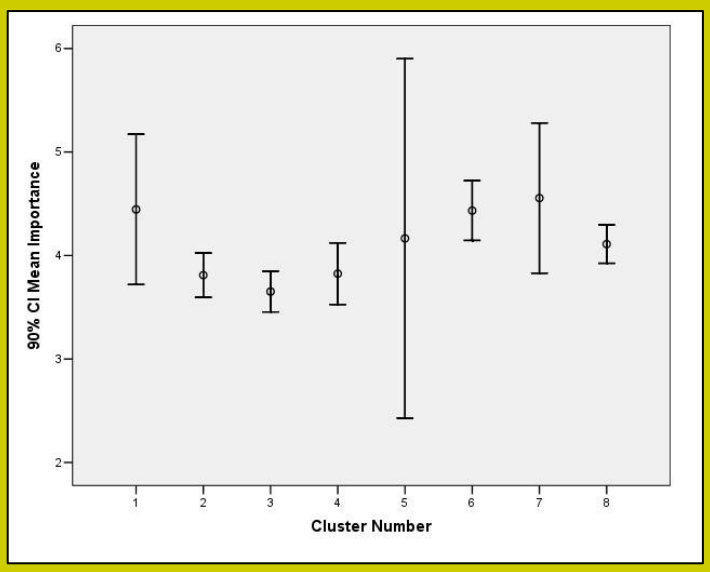



**Chart 6**

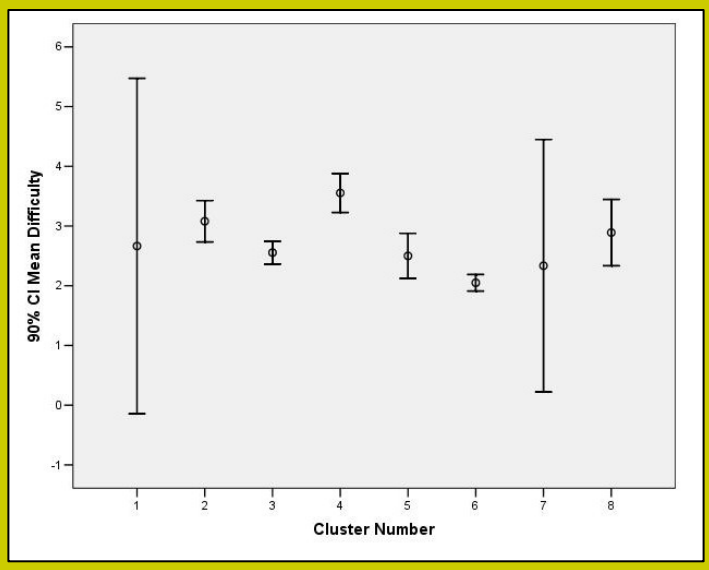



**Chart 7**