# Concept Mapping Workshop: Blue Mountains Rural Fire Service

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

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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 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

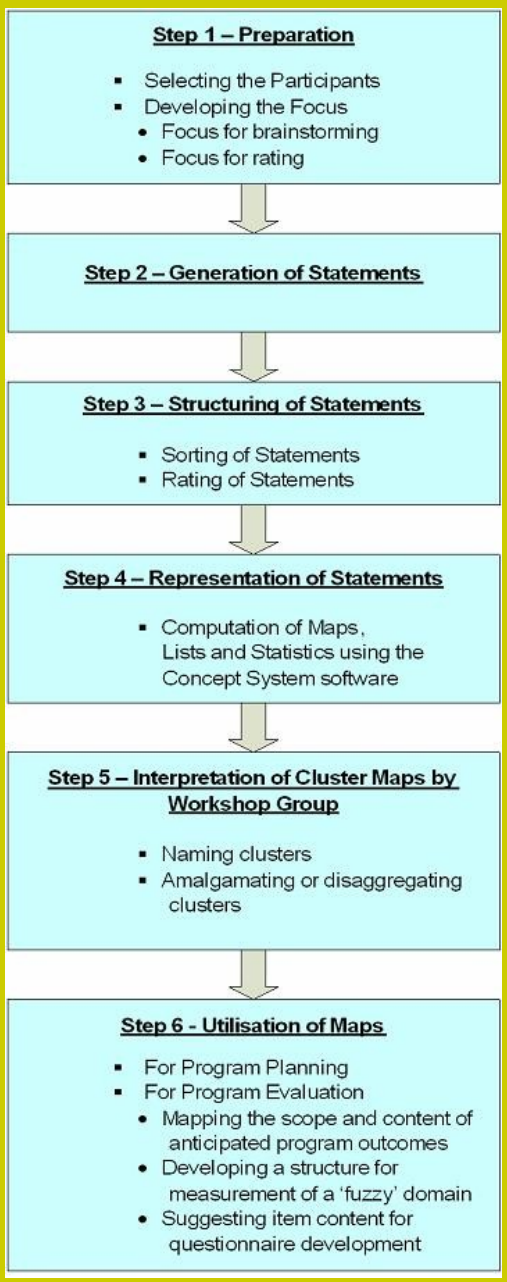



**Chart 1**

## 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: Seven agency personnel from the Katoomba RFS brigade in the Blue Mountains were invited to attend a concept mapping workshop. The workshop took place at the local headquarters.

- 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 <u>importance</u> and <u>difficulty of implementing it</u>.

- 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. Continued involvement of the community with fire agencies and land management agencies to address bushfire hazards
2. Co-ordinated strategies from responsible agencies (similar goals, avoiding conflict and duplication)
3. Ensure that at-risk sections of the community are aware of their risk
4. Agencies working together with RFS and communities to inform the community about why certain landholdings aren't adequately hazard-managed
5. Fire safety becomes part of day-to-day habits and practices
6. Better household preparation prior to bushfire season
7. Design and build houses in bushfire prone areas to resist bushfire
8. Better self-protection of residents - prepared to be self reliant in protecting their property during a fire
9. Better self-reliance of residents during a fire and less dependence on fire agencies
10. Programs are delivered in a cost-effective manner
11. Aware of costs, cost-effectiveness and duplication of effort
12. Communicate with the community SPECIFIC strategies for reducing their risk BEFORE bushfire season
13. Annual campaign prior to bushfire season for a community clean-up - all communities state-wide
14. Communities undertake an effective clean-up process prior to the bushfire season (individual and broader)
15. Fire fighters and community form partnerships in fire-safety
16. Dialogue between fire-services and groups with other priorities that may be complementary (eg conservation)
17. Overcome the 'it won't happen to me' mentality
18. Design and build subdivisions in bushfire prone areas so that lots are less at risk of bushfire
19. Better recruitment program from the community into the brigades
20. Residents are presented with options for managing fire-risk (not just a prescription - information to do what is appropriate for THEIR situation)
21. Provide members of the community with an as realistic as possible risk evaluation for their situation
22. Regular education program for primary and secondary students in schools
23. Fire-fighters become an integral part of the delivery of fire-safety (fire-fighters understand how important the contribution they can make is)
24. Greater community awareness of the effect of bushfires as it impacts properties
25. Community awareness of the environmental effects of bushfires
26. Design and create gardens which reduce the bushfire risk to adjoining homes
27. Development regulations have the flexibility and breadth to allow residents to use appropriate, sit-specific strategies to manage fire-risk
28. Educate community about strategies to deal with bushfires during the fire
29. Community understand strategies and requirements to deal with persisting fire risk after a fire
30. More media promotion of fire-safety on days other than high fire-risk days
31. Defendable spaces provided by resident for fire-fighter safety
32. Residents develop their own networking groups to share fire information (pre, post and during)
33. Emphasis on 'survivability' of houses and properties (during building and also modifying existing buildings)
34. Residents have a plan to stay or go
35. No compulsory evacuations of well-prepared residents who have decided to stay
36. Means of identifying and flagging properties that are well prepared
37. Residents have home survival/safety kits
38. Adequate resources provided to co-ordinate and deliver identified programs
39. The role and contribution of volunteers is appropriate and sustainable
40. Volunteer roles are appropriately resourced and supported
41. All residents understand fuel-management/fuel reduction whether they're on rural or urban properties
42. Greater community involvement in the prevention and mitigation of bushfires
43. Communities not only involved in individual property management but also participate in broader community efforts
44. Prepared to address any language and cultural barriers that exist (preparation and in the event of a fire)
45. The social cost and impact of bushfires is understood in the community (eg schools, tourism)
46. Recognition of the successes and things that are saved not just the losses
47. People understand the difference between 'good bushfire' and 'bad bushfire'
48. People are not afraid of bushfire and of 'bushfire prone areas' but understand them (and accept them as natural)

49. People don't blame others for the occurrence of a fire
50. Participation in bushfire prevention activities is positively reinforced
51. Provide liaison with the community during a bushfire with regards to information and advice
52. National and state programs have consistent messages and efforts
53. Agencies with the responsibility to provide information provide FACTUAL information
54. The effectiveness of educational efforts is evaluated and feedback
55. Design and establish a bushfire control line between urban and bushland areas
56. Connected, accessible asset protection zone (safe access for fire-fighters)

# 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 56 statements means 55 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 Systems program groups statements that are close together (have a similar meaning). For example, cluster 5 consists of statements 13, 22, and 30. 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 5 were concerned with the provision of education. Thus, it was decided that an appropriate name for the cluster would be 'Broadly targeted education/awareness (state & national)'.

In addition to naming individual clusters, participants identified three groupings of clusters that were related. Clusters 2, 5, 6 and 7 were concerned with accurate information and knowledge and the provision of education. Clusters 8, 9 and 10 were all related to preparedness. 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.

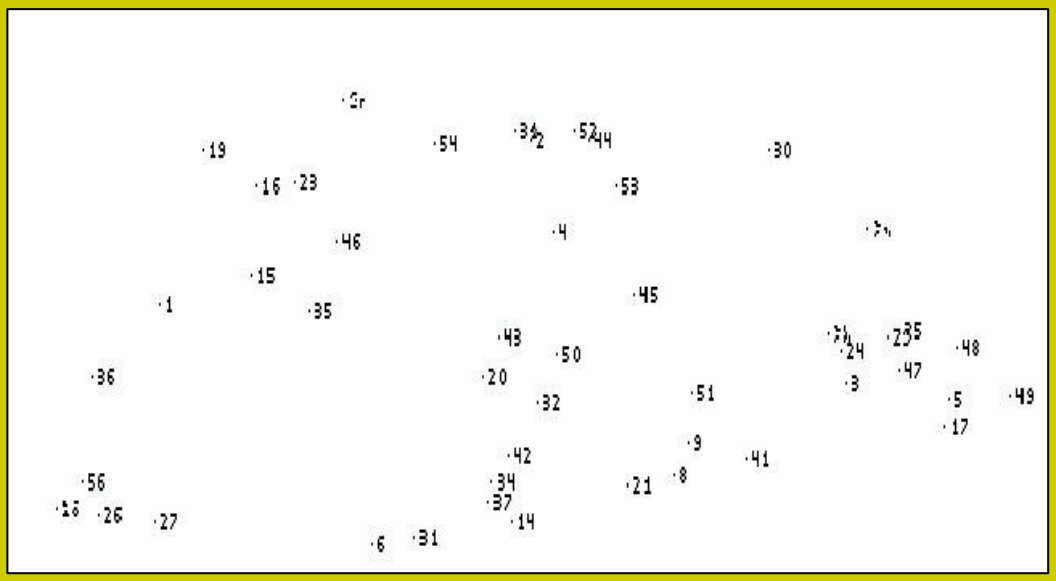
It is important to recognise that cluster analysis is not as robust a process as multi-dimensional scaling. As there is no, one, 'correct' method used to determine the number of clusters, or which points belong in which cluster (the Concept System program starts with approximately the number of clusters 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 Blue Mountains RFS workshop believed should be made:

- Statements 2, 10, 11, 38, 44 & 52: from cluster 2 to cluster 4;
- Statements 16, 19 & 23: from cluster 3 to cluster 1;
- Statement 21: from cluster 9 to cluster 10;
- Statements 39 & 40: from cluster 3 to cluster 2;
- Statement 42: from cluster 8 to cluster 10;
- Statement 51: from cluster 9 to cluster 4;
- Statement 41: linked to both cluster 4 and cluster 6.

In addition to these changes, participants felt resources to implement important changes, the ability to track information about services provided, support for required changes from a higher level, the matching of objectives to proposed activities and a degree of flexibility were not represented on the concept map.

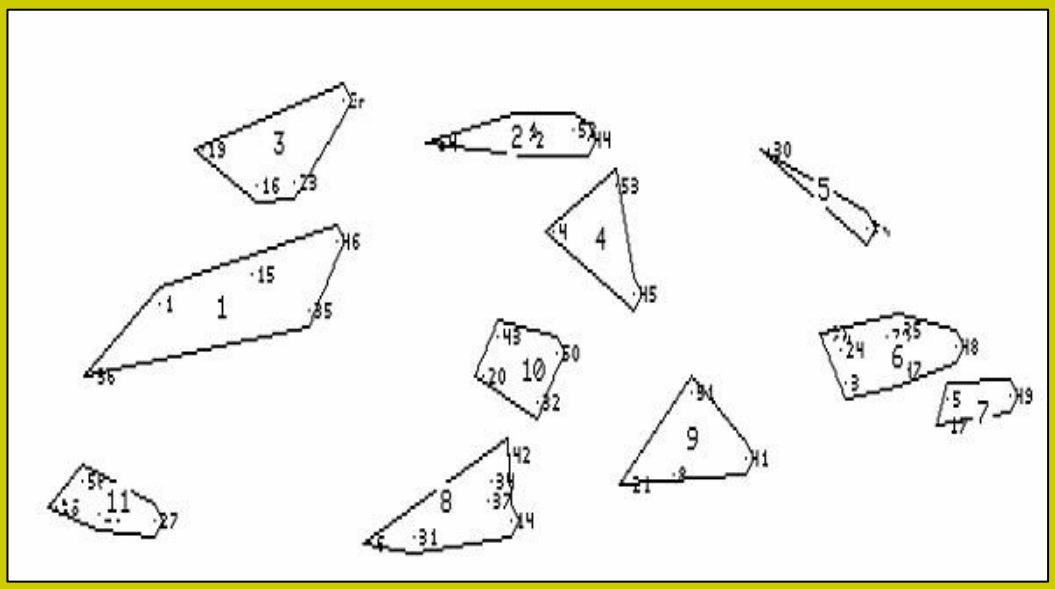
# The Concept Maps Generated During the Workshop



**Map 1**

## Cluster Names

- Cluster 1: Community RFS liaison/networking
- Cluster 2: Quality & co-ordination among programs (evidence)
- Cluster 3: Firefighters and volunteers role in & with the community – agency liaison
- Cluster 4: “Tell it like it is”
- Cluster 5: Broadly targeted education/awareness (state & national)
- Cluster 6: Local community understanding/ awareness (outcomes)
- Cluster 7: “I am responsible” (change in attitudes & perceptions) culture change
- Cluster 8: Household behaviour/preparation (considers residents and owners)
- Cluster 9: Taking responsibility in action – household level (resilience)
- Cluster 10: Taking responsibility as a community
- Cluster 11: Building and development (control, plan education)



**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.

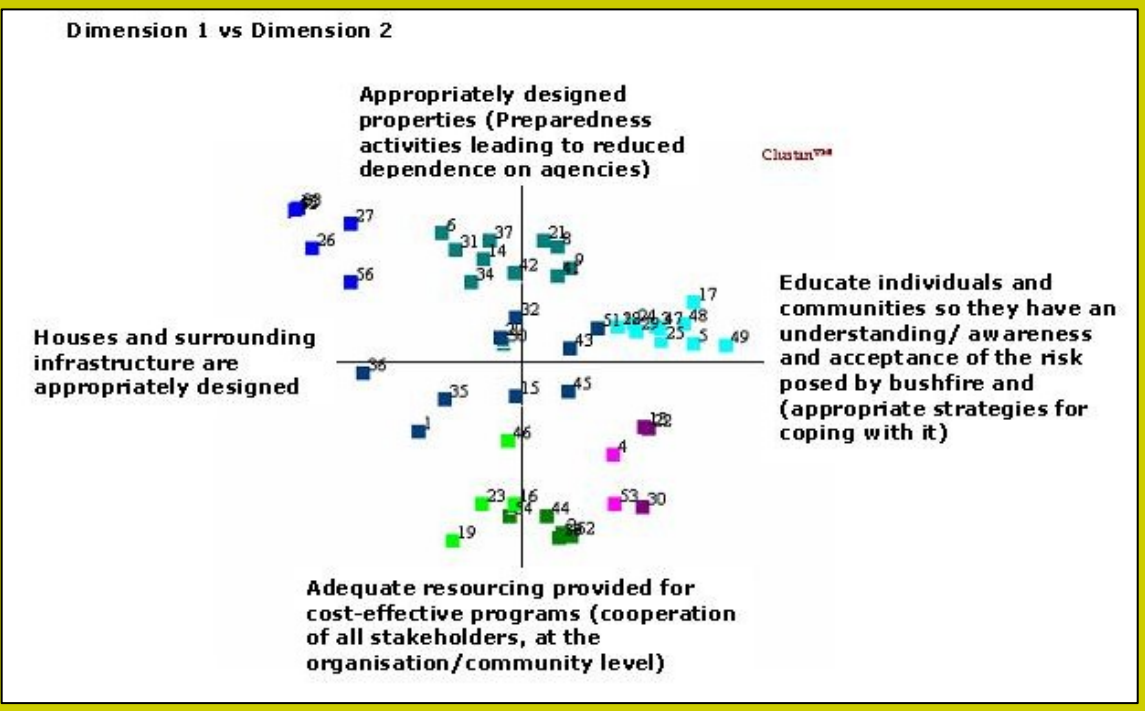
As with the 2-dimensional concept map, broad themes were identified in the 3-dimensional maps. They were:

- Dimension 1 (right: Maps 3 & 4):Educate individuals and communities so they have an understanding/awareness and acceptance of the risk posed by bushfire (and appropriate strategies for coping with it)
- Dimension 1 (left: Maps 3 & 4): Houses and surrounding infrastructure are appropriately designed
- Dimension 2 (top: Map 3): Appropriately designed properties (Preparedness activities leading to reduced dependence on agencies)
- Dimension 2 (bottom: Map 3): Adequate resourcing provided for cost-effective programs (co-operation of all stakeholders, at the organisation/community level)
- Dimension 3 (top: Map 4): Effective education for practical aspects
- Dimension 3 (bottom: Map 4): Agency/community interaction/formation of partnerships to make appropriate choices

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 ‘Educating individuals and communities so they have an understanding/awareness and acceptance of the risk posed by bushfire and appropriate strategies for coping with it’ is one process whereby the outcome of ‘houses and surrounding infrastructure are appropriately designed’ 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.

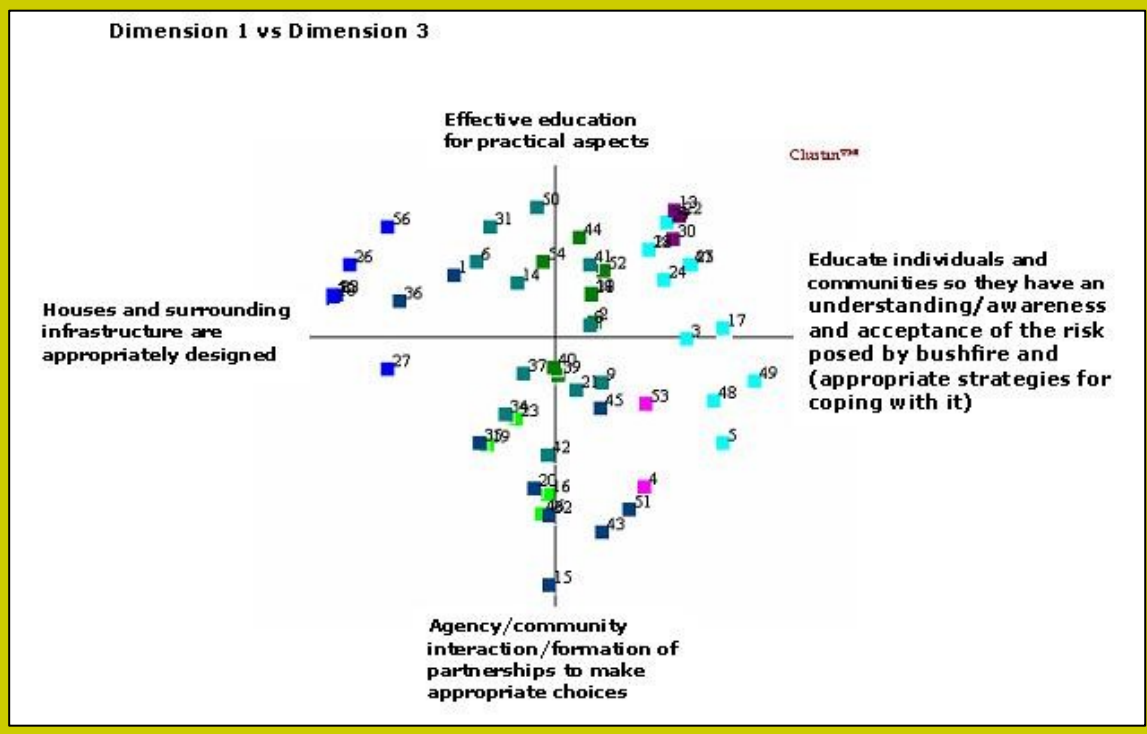
# 3-Dimensional Concept Maps




**Map 3**

## Cluster Names

- Cluster 1 (Statements 1, 15, 20, 32, 35, 36, 43, 45 & 51): Community involvement & networking
- Cluster 2 (Statements 7, 18, 26, 27, 33, 55 & 56): Houses (new & existing) & surrounding infrastructure are appropriately designed/prepared
- Cluster 3 (Statements: 2, 10, 11, 38, 39, 40, 44, 52 & 54): Programs co-ordinated & resourced
- Cluster 4 (Statements 4 & 53): Agencies work together to provide factual information
- Cluster 5 (Statements 16, 19, 23 & 46): Interaction between agencies & communities
- Cluster 6 (Statements 3, 5, 12, 17, 24, 25, 28, 29, 47, 48 & 49): Community understanding & awareness of bushfire
- Cluster 7 (Statements 13, 20 & 22): Actions to achieve community understanding & awareness (media campaigns/ education)
- Cluster 8 (Statements 6, 8, 9, 14, 21, 31, 34, 37, 41, 42 & 50): Residents plan & prepare for risk




**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: Community RFS liaison/networking
- Cluster 2: Quality & coordination among programs (evidence)
- Cluster 3: Firefighters & volunteers role in & with the community – agency liaison
- Cluster 4: “Tell it like it is”
- Cluster 5: Broadly targeted education/awareness (state & national)
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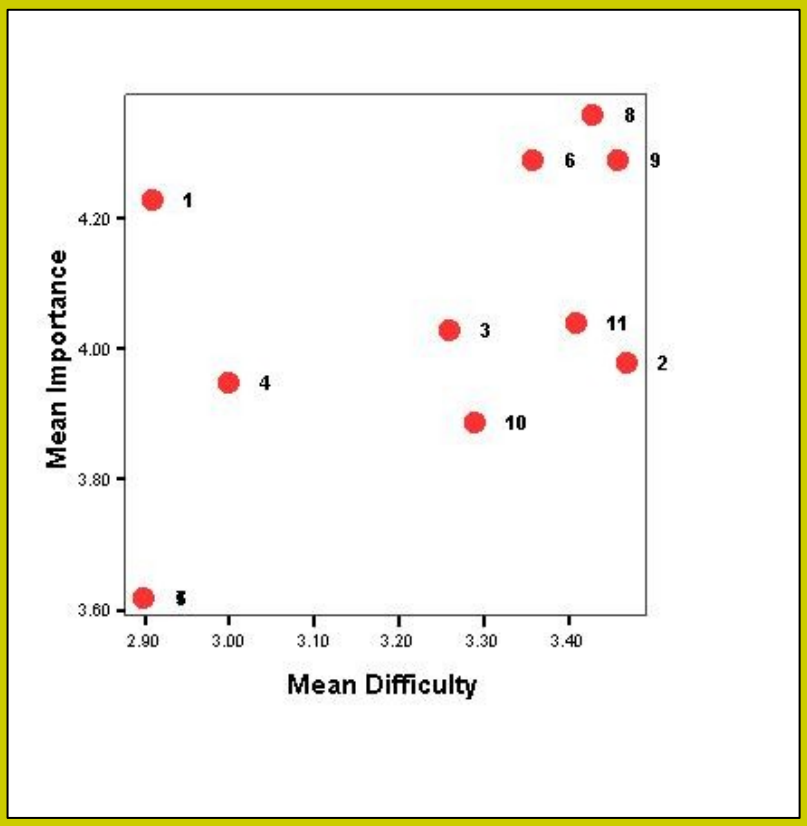


**Chart 2**

| Cluster No. | Mean Imp. | Mean Diff. |
|---|---|---|
| 1 | 4.2 | 2.9 |
| 2 | 4.0 | 3.5 |
| 3 | 4.0 | 3.3 |
| 4 | 4.0 | 3.0 |
| 5 | 3.6 | 2.9 |
| 6 | 4.3 | 3.4 |
| 7 | 3.6 | 2.9 |
| 8 | 4.4 | 3.4 |
| 9 | 4.3 | 3.5 |
| 10 | 3.9 | 3.3 |
| 11 | 4.0 | 3.4 |

| 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: Community involvement and networking
- Cluster 2: Houses (new & existing) and surrounding infrastructure are appropriately designed/prepared
- Cluster 3: Programs coordinated and resourced
- Cluster 4: Agencies work together to provide factual information
- Cluster 5: Interaction between agencies and communities
- Cluster 6: Community understanding and awareness of bushfire
- Cluster 7: Actions to achieve community understanding and awareness (media campaigns/ education)
- Cluster 8: Residents plan and prepare for risk

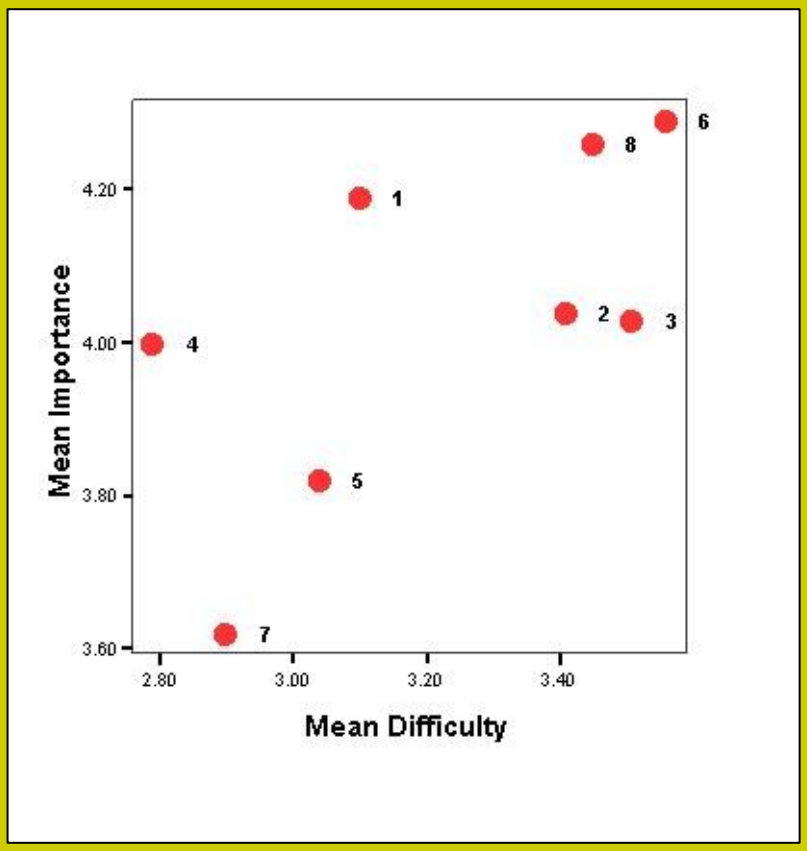


**Chart 3**

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

| Cluster No. | Mean Imp. | Mean Diff. |
|---|---|---|
| 1 | 4.2 | 3.1 |
| 2 | 4.0 | 3.4 |
| 3 | 4.0 | 3.5 |
| 4 | 4.0 | 2.8 |
| 5 | 3.8 | 3.0 |
| 6 | 4.3 | 3.6 |
| 7 | 3.6 | 2.9 |
| 8 | 4.3 | 3.5 |

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

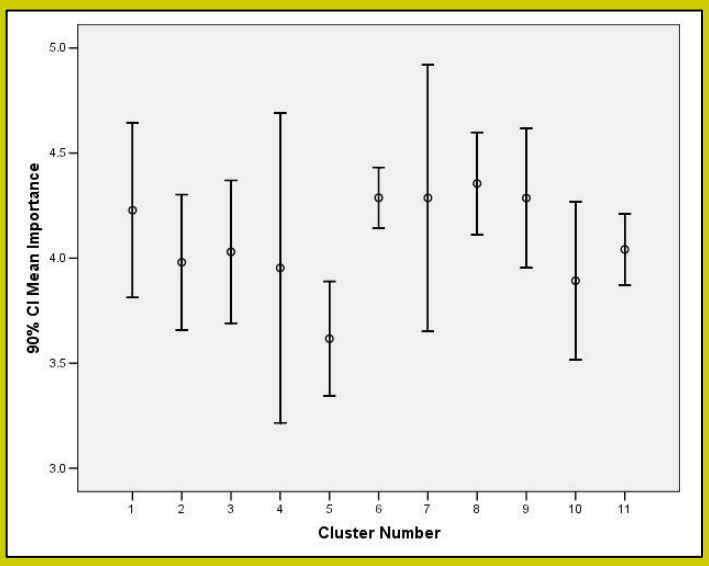


**Chart 4**

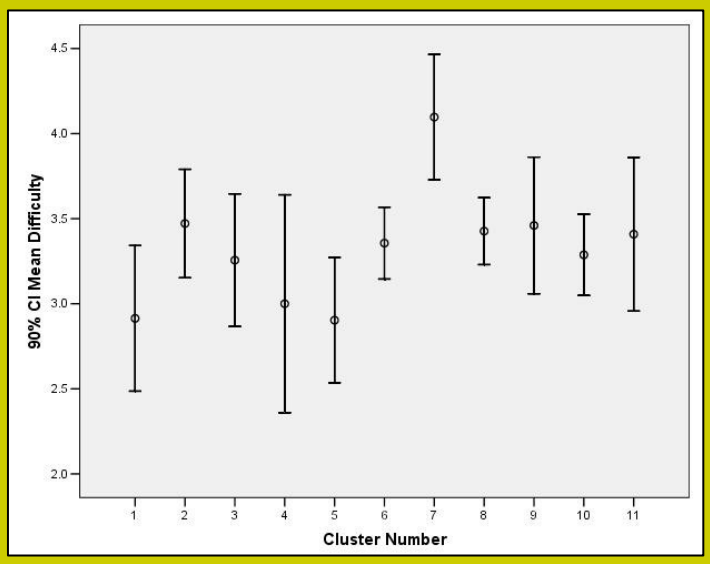


**Chart 5**

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 (Community understanding and awareness of bushfire ) is more important than cluster seven (Actions to achieve community understanding and awareness (media campaigns/ education)) 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).

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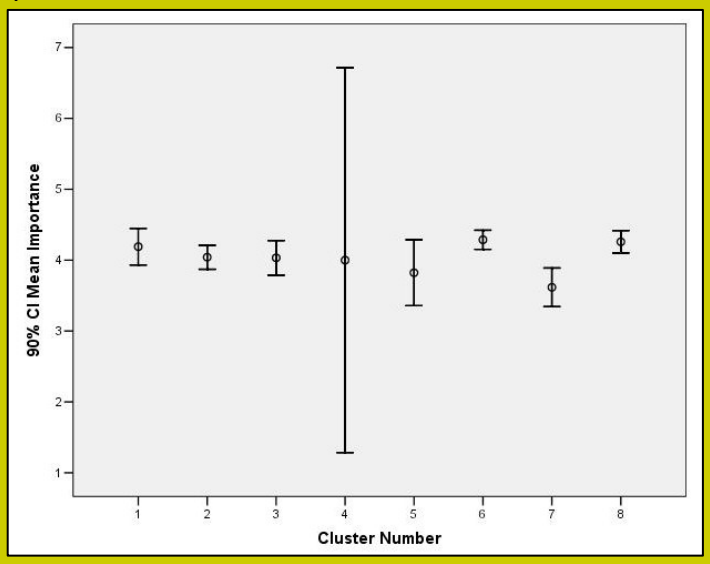


**Chart 6**

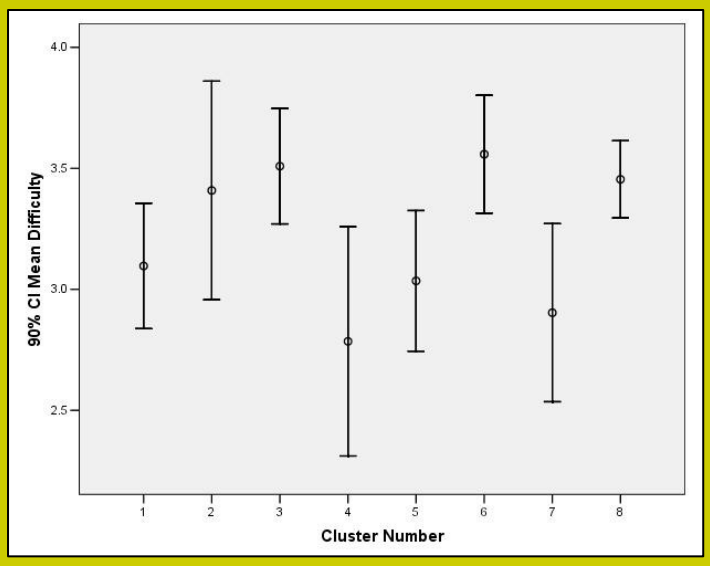


**Chart 7**