# Concept Mapping Workshop: Country 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

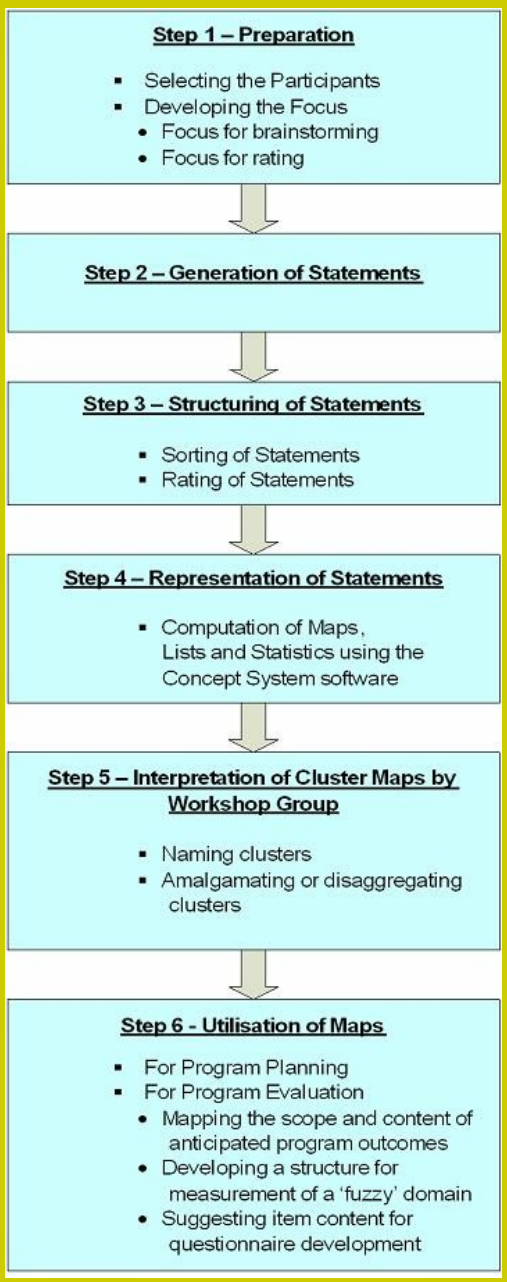



**Chart 1**

## 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: Twelve agency personnel from the Country Fire Service (CFS) were invited to attend a concept mapping workshop. The workshop took place in Adelaide, close to CFS 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. Change people's perception and lack of interest regarding fire safety
2. Individuals take responsibility for their own safety
3. More awareness among the public through community awareness programs
4. Timely and adequate information on imminent threat (real time information that complements local early warning networks)
5. Effective local communication and early warning networks
6. People have access to samples and examples of practical things they do (eg garden design, sprinkler system, farm fire units, etc)
7. Greater understanding of fire hazards and level of risk (for themselves and generally)
8. Communities/people need an awareness of their responsibility for self-management of community fire safety initiatives
9. Better community information on potential fire impact for people in rural, semi-rural and urban areas
10. Every home is a spark-proof box
11. Integration of bushfire information with other community education programs and efforts
12. Improved fire-behaviour knowledge (community all the way to researchers)
13. Control and limit unsuitable development in bushfire prone areas (both before and after initial development)
14. Take the responsibility for bush-fire prevention away from local government (back to CFS)
15. State government recognises need to fund community safety programs and delivery
16. Community awareness extends beyond special forums into existing organisations like schools
17. Children and adolescents develop an early appreciation and understanding of risks and appropriate behaviours (age appropriate)
18. Residents practice implementing their action plan in real time (so they can see the flaws in it)
19. CFS broadens its orientation to include not just response but also recovery, planning and preparation
20. CFS considers how it engages and works with people with disability or special needs who are unable to implement general recommendations
21. Realistic community awareness of limits of fire service capability (eg not fire-truck at every door, some fires can't be put out)
22. Communities need to have ownership in the development of their own fire safety programs
23. A whole of community approach to fire prevention (eg Pathway)
24. Every home has (appropriate to circumstances) adequate fuel reduced zones, water and reticulation
25. National awareness strategy that motivates and rewards communities
26. Achieve cultural change in communities
27. Incentives are available for people to use fire safe retardant products (eg government or insurance rebate)
28. Bushfire/fire safe display centre (garden centre) relevant to South Australia and even regions (could be virtual)
29. Local government takes their role in prevention and planning seriously
30. Community understands that local government have responsibility to enforce fire safety standards
31. Communities need to understand the partnerships that are or may be involved in fire prevention
32. Understanding by councils of risk and asset relationship (use assets in a targeted way in areas of assessed highest risk)
33. Targeted marketing to specific groups
34. Appropriate marketing and messages to people who use areas recreationally
35. Appropriate publicisation of daily, local fire danger (levels of preparedness, level of alert)
36. Communities need options for community fire-safety as opposed to one-stop shop
37. Understanding of fuel and fire relationship (including types of fuel)
38. Need a layman's language on bushfire behaviour and risk
39. People understand and are not inhibited by Native Vegetation Act
40. Have state-wide/nation-wide threat mapping (risk, hazard and community vulnerability, eg vulnerable groups)
41. Tools for constant evaluation and monitoring of fire safety strategies and programs
42. Communities need to have the tools to set long-term strategic directions and plans for their fire safety (consultation processes, risk assessment, information)
43. Householders and builders understand responsibilities for complying with building codes
44. Councils understand responsibilities to promote and enforce codes
45. Building codes are strengthened, appropriate and updated as knowledge increases
46. Penalties for non-compliance with codes are applied

47. Publish breaches and fires to increase compliance among others
48. People understand legislative responsibilities (eg, grinding, welding, campfires)
49. Police understand legislative requirements
50. Sharing of information within and between agencies at all levels (local, state and national)
51. Improve neighbourhood relationships to encourage assistance between neighbours to prepare and respond
52. Consistent and appropriately delivered message (not just the thoughts of an individual. Require specific guidelines about the message and information to deliver)
53. Different local organisations need to deliver a common message
54. Examples of good practice are rewarded and widely publicised
55. Brigades understand and are fostered/supported in their community education role
56. Community understand that CFS participation is voluntary (and this limits service capacity)
57. Communities understand roles and capabilities of agencies (CFS, local government)
58. People need to understand that changes can make a real difference to their risk
59. People feel ABLE to implement effective protective measures
60. Large land-owners understand fuel modified zones

# 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 60 statements means 59 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 4 consists of statements 2, 18, 22 and 39. 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 4 were concerned with community members accepting responsibility for their own safety. Thus, it was decided that an appropriate name for the cluster would be 'Resident understanding, responsibility and action'.

In addition to naming individual clusters, participants identified five groupings of clusters that were related. Clusters 1, 2 and 6 were concerned with information and how an increase in knowledge can lead to empowerment. Participants felt that cluster 4 ('Resident understanding, responsibility and action') had links to both this group and cluster 5 ('Specific actions – preparedness'). Clusters 7 and 8 were related to community awareness of the risk posed by bushfire and the means by which information should be disseminated.

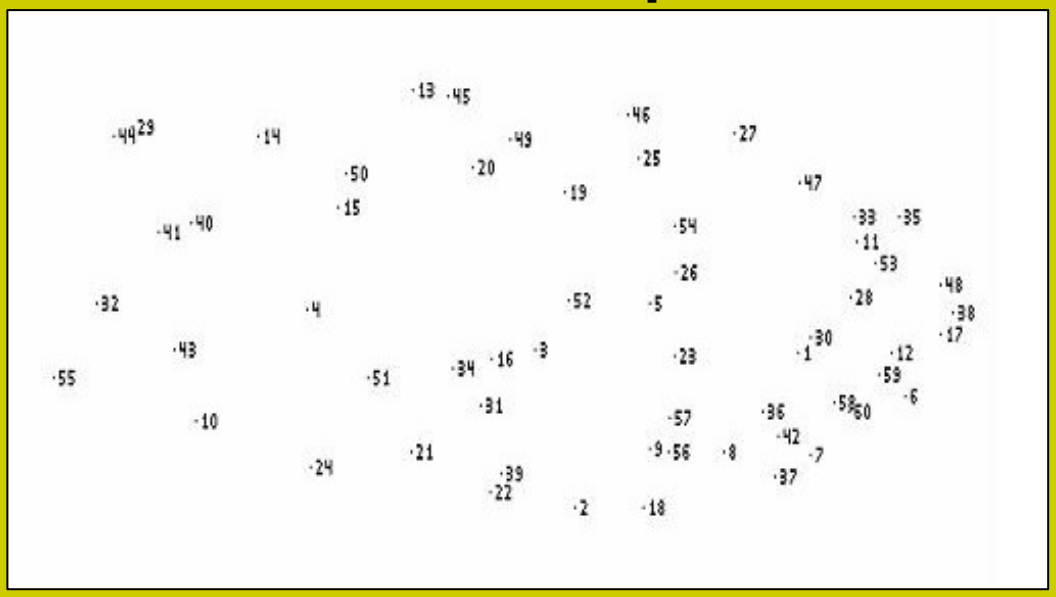
Clusters 9 and 10 were also identified by the participants as being related, both being concerned with community members and agency personnel understanding their roles within the broad framework making the community safer from bushfires. While participants in the concept mapping workshop believed clusters 9 and 10 were related, they also felt that cluster 10 was linked with clusters 11 and 12, all three bearing some relationship to the development of policy. 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.

There was only one change participants in the CFS workshop believed should be made:

- Statements 41: from cluster 10 to cluster 11.

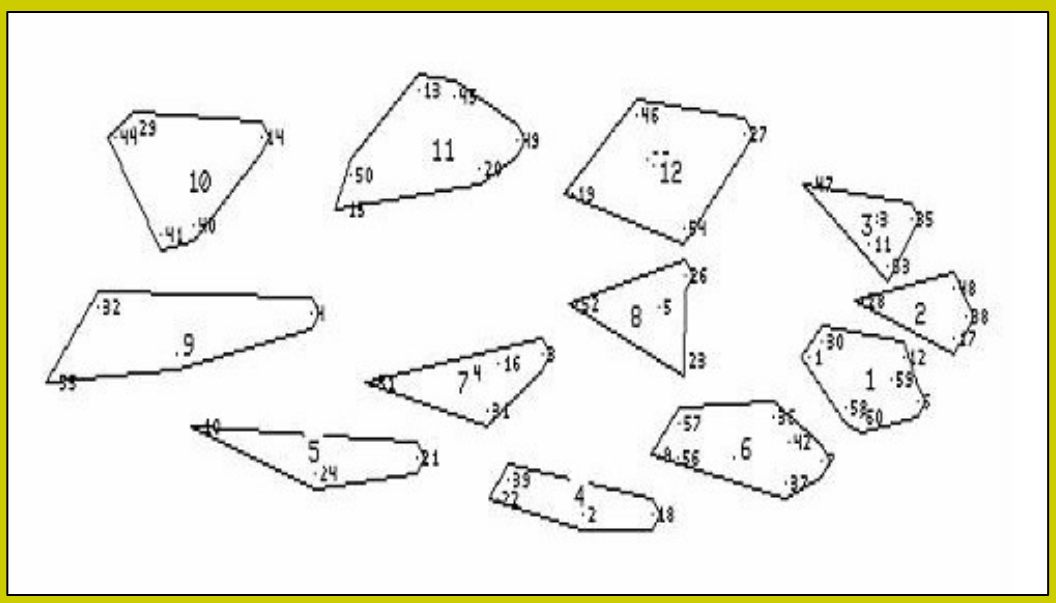
# The Concept Maps Generated During the Workshop



**Map 1**

## Cluster Names

- Cluster 1: People/empowerment
- Cluster 2: Learning
- Cluster 3: Marketing/delivery strategies
- Cluster 4: Resident understanding, responsibility and action
- Cluster 5: Specific actions - preparedness
- Cluster 6: Community needs understanding
- Cluster 7: Awareness
- Cluster 8: Communication
- Cluster 9: Role clarity
- Cluster 10: Legislation
- Cluster 11: Agencies and infrastructure – policy and legislation
- Cluster 12: Lollies and sticks




**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.

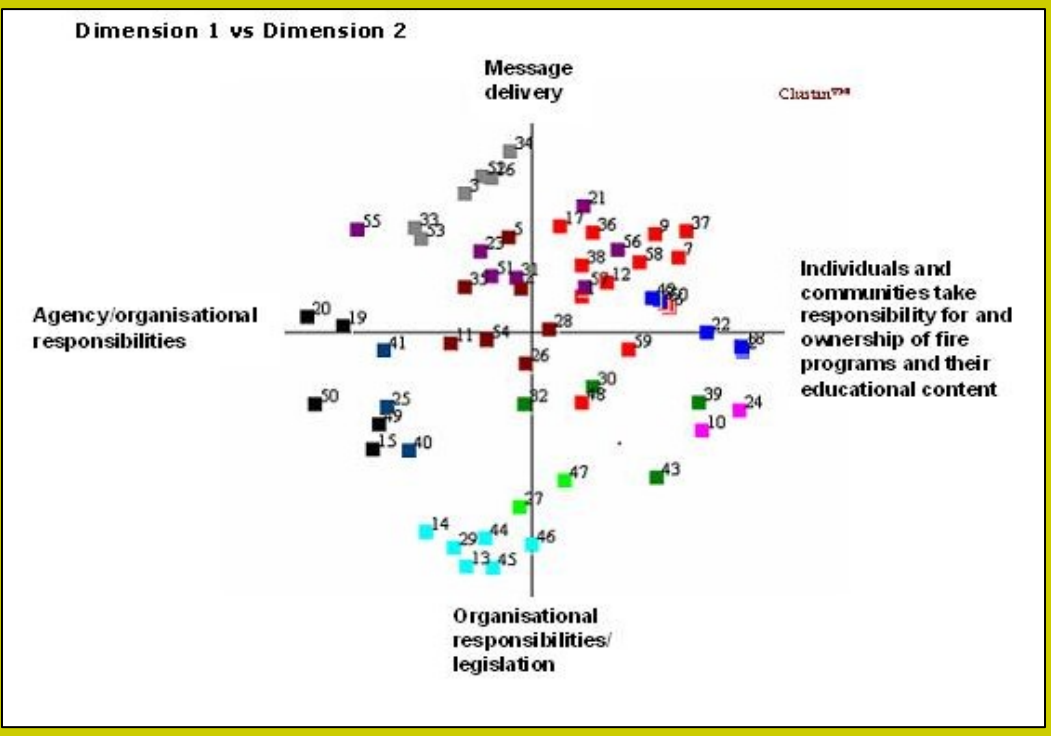
As with the 2-dimensional concept map, broad themes were identified in the 3-dimensional maps. They were:

- Dimension 1 (right: Maps 3 & 4):Individuals and communities take responsibility for and ownership of fire programs and their educational content
- Dimension 1 (left: Maps 3 & 4): Agency/organisational responsibilities
- Dimension 2 (top: Map 3): Message delivery
- Dimension 2 (bottom: Map 3): Organisational responsibilities/ legislation
- Dimension 3 (top: Map 4): Understanding of roles and responsibilities and how they interconnect
- Dimension 3 (bottom: Map 4): Communication of information

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 ‘Communication of information ’ is one process whereby the outcome of ‘Individuals and communities take responsibility for and ownership of fire programs and their educational content’ 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.

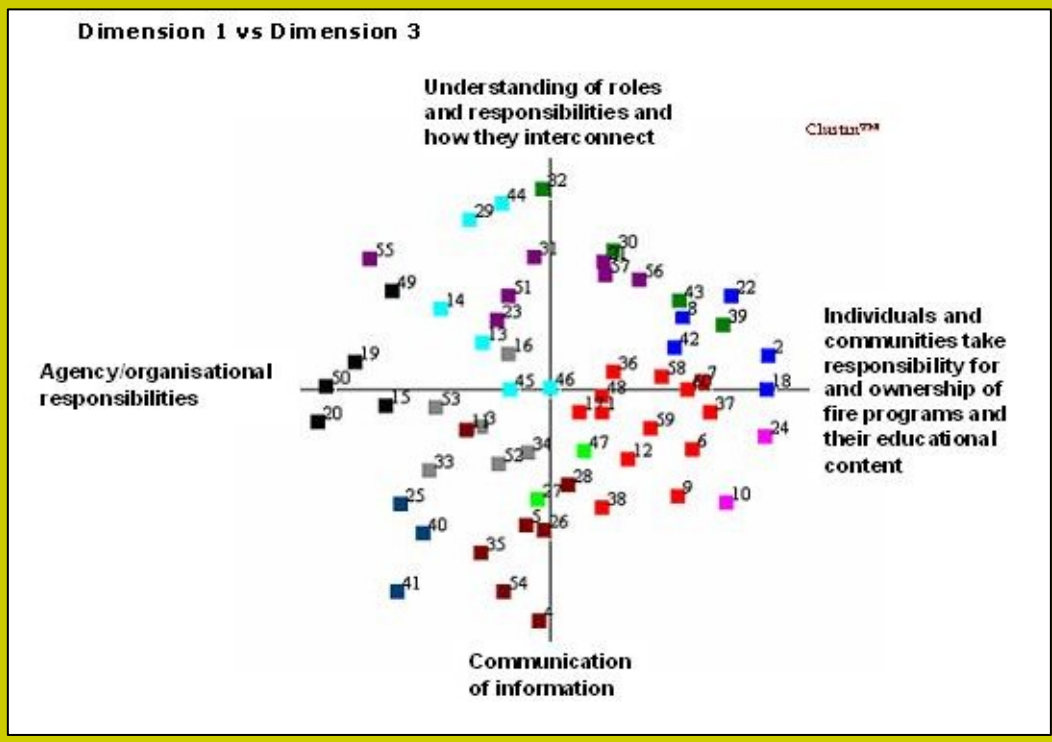
# 3-Dimensional Concept Maps




Map 3

## Cluster Names

- Cluster 1 (Statements 1, 6, 7, 9, 12, 17, 36, 37, 38, 58, 59 & 60): Individual/community understanding of risk
- Cluster 2 (Statements 2, 8, 18, 22, & 42): Cluster 2: Responsibility and ownership on an individual and community level as a necessity
- Cluster 3 (Statements: 30, 32, 39 & 43): Understand/respect role of local government and the need to comply with legislation
- Cluster 4 (Statements 10 & 24): Appropriately prepared households
- Cluster 5 (Statements 27 & 47): Appropriate use of incentives and powers
- Cluster 6 (Statements 13, 14, 29, 44, 45 & 46): Appropriate use of regulatory powers
- Cluster 7 (Statements 3, 16, 33, 34, 52 & 53): Appropriately worded and targeted messages to increase community awareness
- Cluster 8 (Statements 21, 23, 31, 51, 55, 56 & 57): Community understanding of the role and capacity (both operational and educational) of the agency and the need to work with them
- Cluster 9: (Statements: 4, 5, 11, 26, 28, 35 & 54): Timely/ adequate information appropriately disseminated
- Cluster 10: (Statements: 25, 40 & 41): Systems in place at a national level for communication strategies, monitoring and evaluation
- Cluster 11: (Statements: 15, 19, 20, 49 & 50): Clear definition of agency responsibilities, including integration and appropriate funding




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: People/empowerment
- Cluster 2: Learning
- Cluster 3: Marketing/delivery strategies
- Cluster 4: Resident understanding, responsibility and action
- Cluster 5: Specific actions - preparedness
- Cluster 6: Community needs understanding
- Cluster 7: Awareness
- Cluster 8: Communication
- Cluster 9: Role clarity
- Cluster 10: Legislation
- Cluster 11: Agencies and infrastructure – policy and legislation
- Cluster 12: Lollies and sticks

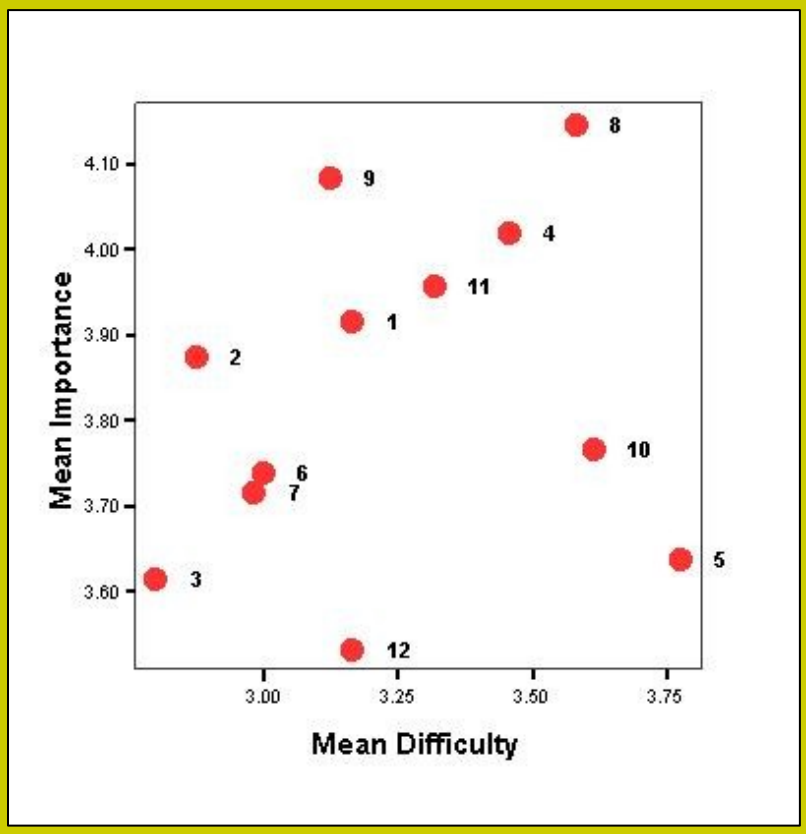



**Chart 2**

| Cluster No. | Mean Imp. | Mean Diff. |
|---|---|---|
| 1 | 3.9 | 3.2 |
| 2 | 3.9 | 2.9 |
| 3 | 3.6 | 2.8 |
| 4 | 4.0 | 3.5 |
| 5 | 3.6 | 3.8 |
| 6 | 3.7 | 3.0 |
| 7 | 3.7 | 3.0 |
| 8 | 4.2 | 3.6 |
| 9 | 4.1 | 3.1 |
| 10 | 3.8 | 3.6 |
| 11 | 4.0 | 3.3 |
| 12 | 3.5 | 3.2 |

| 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: Individual/community understanding of risk
- Cluster 2: Responsibility and ownership on an individual and community level as a necessity
- Cluster 3: Understand/respect role of local government and the need to comply with legislation
- Cluster 4: Appropriately prepared households
- Cluster 5: Appropriate use of incentives and powers
- Cluster 6: Appropriate use of regulatory powers
- Cluster 7: Appropriately worded and targeted messages to increase community awareness
- Cluster 8: Community understanding of the role and capacity (both operational and educational) of the agency and the need to work with them
- Cluster 9: Timely/adequate information appropriately disseminated
- Cluster 10: Systems in place at a national level for communication strategies, monitoring and evaluation
- Cluster 11: Clear definition of agency responsibilities, including integration and appropriate funding

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

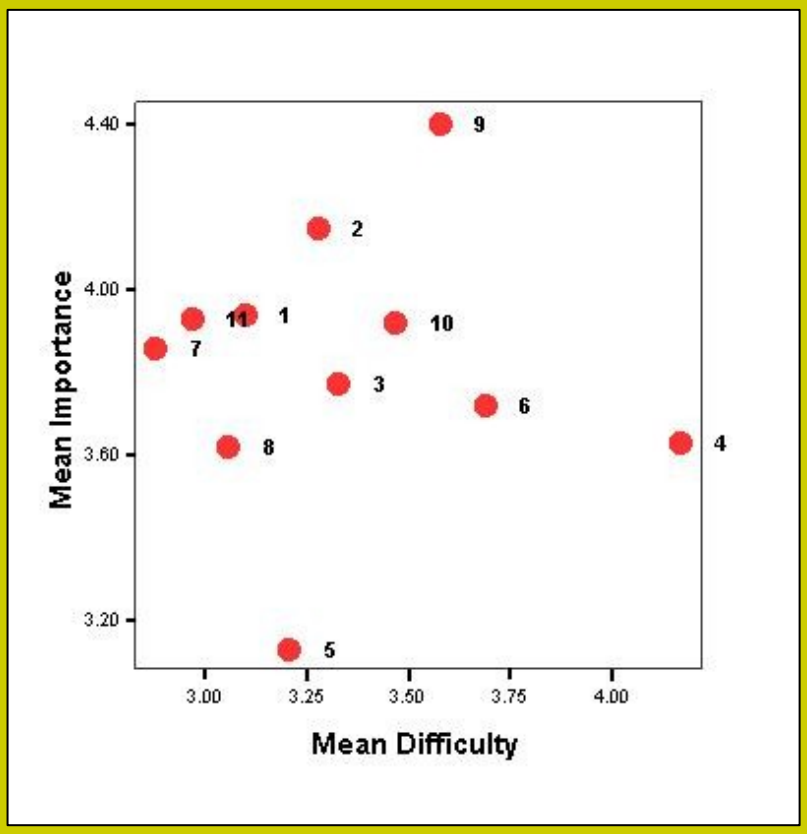



**Chart 3**

| Cluster No. | Mean Imp. | Mean Diff. |
|---|---|---|
| 1 | 3.9 | 3.1 |
| 2 | 4.2 | 3.3 |
| 3 | 3.8 | 3.3 |
| 4 | 3.6 | 4.2 |
| 5 | 3.1 | 3.2 |
| 6 | 3.7 | 3.7 |
| 7 | 3.9 | 2.9 |
| 8 | 3.6 | 3.1 |
| 9 | 4.4 | 3.6 |
| 10 | 3.9 | 3.5 |
| 11 | 3.9 | 3.0 |

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

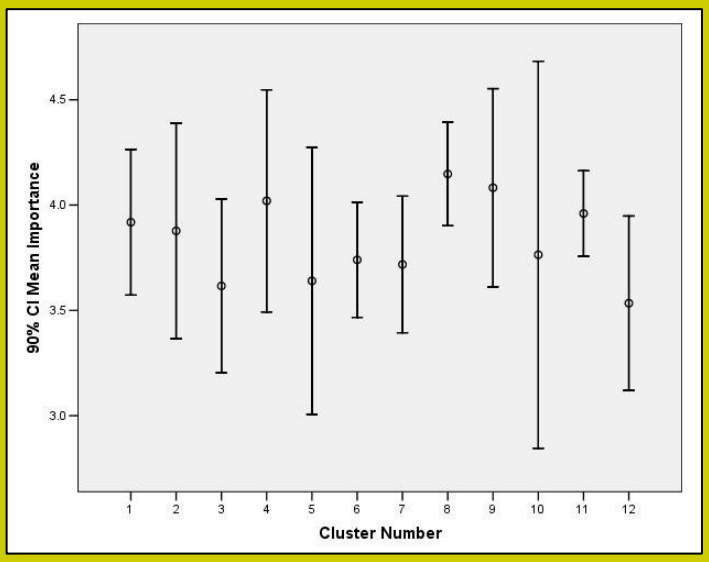



**Chart 4**

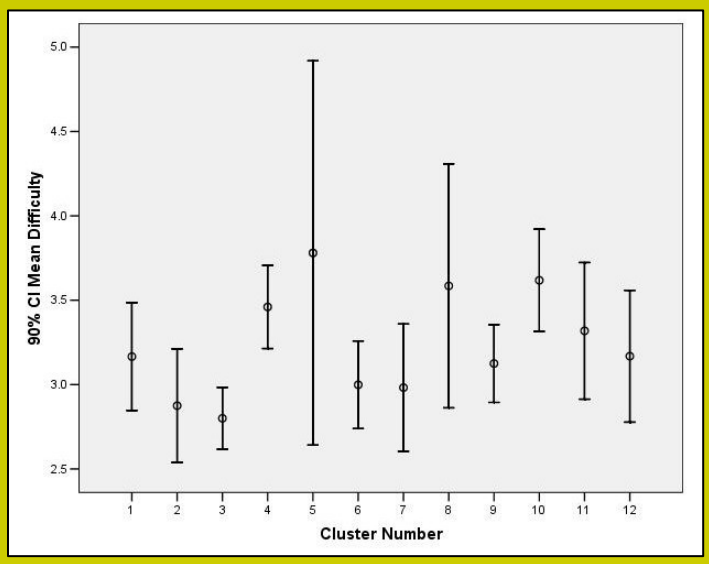



**Chart 5**

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 four (Appropriately prepared households) is more difficult to achieve than cluster seven (Appropriately worded and targeted messages to increase community awareness) when making households and communities safer from bushfire. Chart 7 shows that this difference is statistically significant (if the error bars do not overlap the difference is statistically significant).

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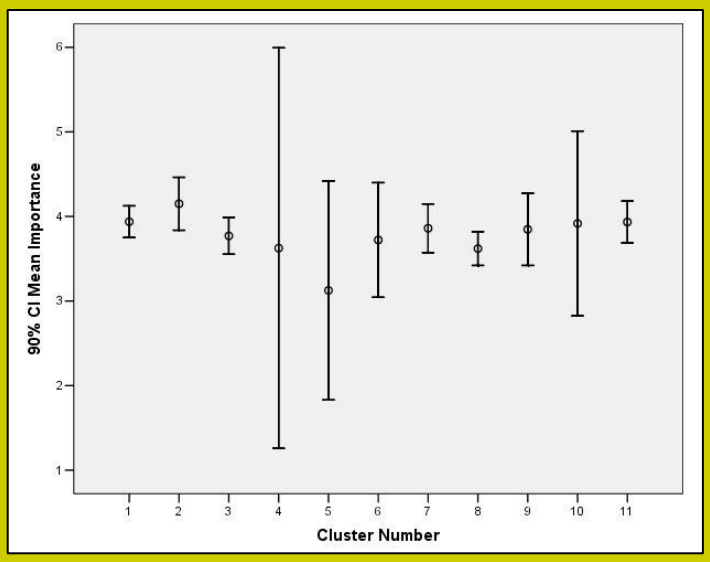


**Chart 6**

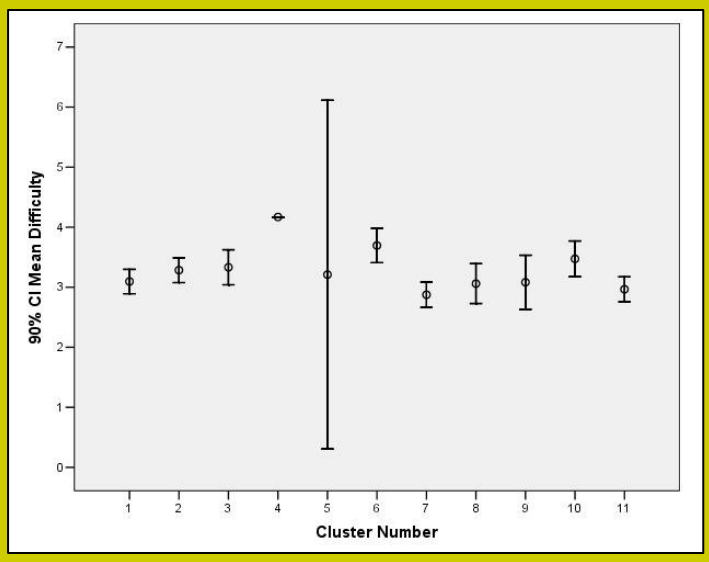


**Chart 7**