# Concept Mapping Workshop: Tasmanian 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

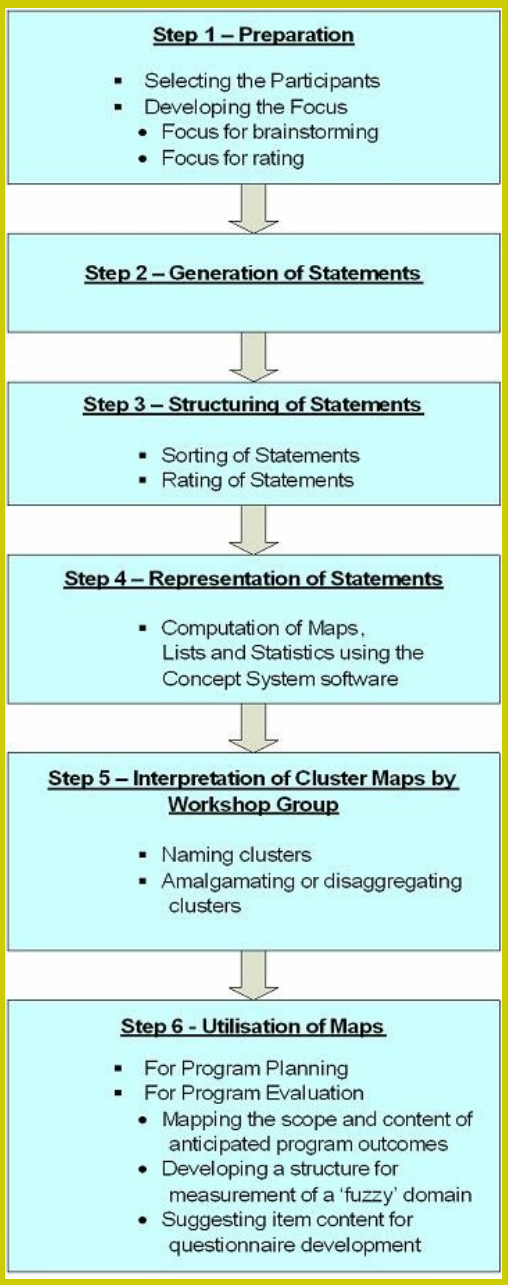



**Chart 1**

## 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 Tasmanian Fire Service (TSF) were invited to attend a concept mapping workshop. The workshop took place at TSF 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. Needs to be clearly articulated and described how to make people safer from bushfire
2. Individual behavioural change needs to be achieved
3. Identify at risk groups, gender/age etc. - for targeting strategies and education
4. Increased acceptance of responsibility for treating risks - all levels (individuals, communities, governments)
5. People in bushfire prone areas have an understanding of fire and the factors that influence fire behaviour (in their circumstances)
6. Categorise (make specific) risk - households and neighbourhoods be made aware of the level of risk that specifically relates to their area (in addition to just general information)
7. Education programs give confidence in fire services and fire strategies
8. Fire agencies need to have tools for communicating risk management and mitigation strategies IN WAYS THAT WILL CAUSE PEOPLE TO TAKE ACTION
9. Development of consistent policy among all levels of government in relation to bushfire mitigation
10. Consistent messages put out by different agencies and levels of government
11. Different levels of government have consistent management strategies for land that is their responsibilities
12. Development of programs IN COLLABORATION with community (they are involved in determining and establishing programs)
13. Increase the range of options available for treating risks (people have options that suit their lifestyle and world view and capability)
14. Creating an awareness of how individual actions can impact on their neighbours and community
15. Householders are kept informed about a fire that is or could impact on their property, regardless of where it is (urban or rural)
16. Need compatibility/consistency between legislation related to building/planning and bushfire prevention
17. Community need to understand their role when bushfire strikes and the role of fire services
18. People not confused by images and occurrences in other states (eg evacuation policies)
19. People have realistic expectations about what fire services can do for their property when there is a major fire
20. People have the capacity to defend their own property
21. Clear and realistic expectations about what individuals/households need to do, and what fire services will do before, during and after a fire event
22. Need to have a good understanding about what motivates people to prepare (or not to prepare) in the range of circumstances they face
23. Strategies to maintain motivation and preparation over many years (despite variability in risk over time)
24. Media accept responsibility in relation to reporting about deliberately lit fires
25. Media participate in getting information out to the community during a fire
26. Funding/resource allocation for proper analysis of programs and strategies (evaluation)
27. The whole community maintains support for prevention and mitigation (support for consistent funding and effort)
28. Individuals and households review their plan with all family members
29. Individuals and households ensure physical/equipment preparations to be able to implement their plans
30. Community aware of the effect of changes in infrastructure and other circumstances on previously held beliefs (eg availability of water, change from sheep to tree farming, reticulated gas)
31. Sensible land-use planning policies and practices - consistently applied across all levels of government
32. Requirement for householders to MAINTAIN levels of preparation safety (analogous to road worth car) (ways of enforcing this)
33. Land use planning arrangements ongoing and adaptive (for change of owners and uses over time)
34. Effective penalties and enforcement against behaviours that create a fire risk
35. Need to find strategies to minimise deliberately lit fires
36. Identify urban/rural interface and future risk areas and target education strategies to these areas
37. Use effective education strategies including face to face
38. Funding the transition from unsafe to safe development strategies (eg buy out high risk properties)
39. Land use and building policies prevent people rebuilding in unsafe ways/locations
40. All stakeholders send out fire prevention messages and support preventative behaviours (eg insurance companies)
41. Information is provided to people in the ways in which they want to receive it (and will receive it effectively) - based on research, interviews, consultation
42. People moving into a high-risk area receive appropriate information/education
43. Prosecutions publicised in order to get the message out to others

# 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 43 statements means 42 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 2 consists of statements 2, 5, 14, 19 and 42. 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 identified desired outcomes and effects of education. Thus, it was decided that an appropriate name for the cluster would be 'Education, effects and outcomes'.

In addition to naming individual clusters, participants identified three groupings of clusters that were related. Clusters 1, 2 and 3 were concerned with aspects of education. Clusters 5 and 8 were both related community commitment and participation to making themselves safer from bushfire. Clusters 6, 7, 9 and 10 were related to the development of policies and their consistent application. 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.

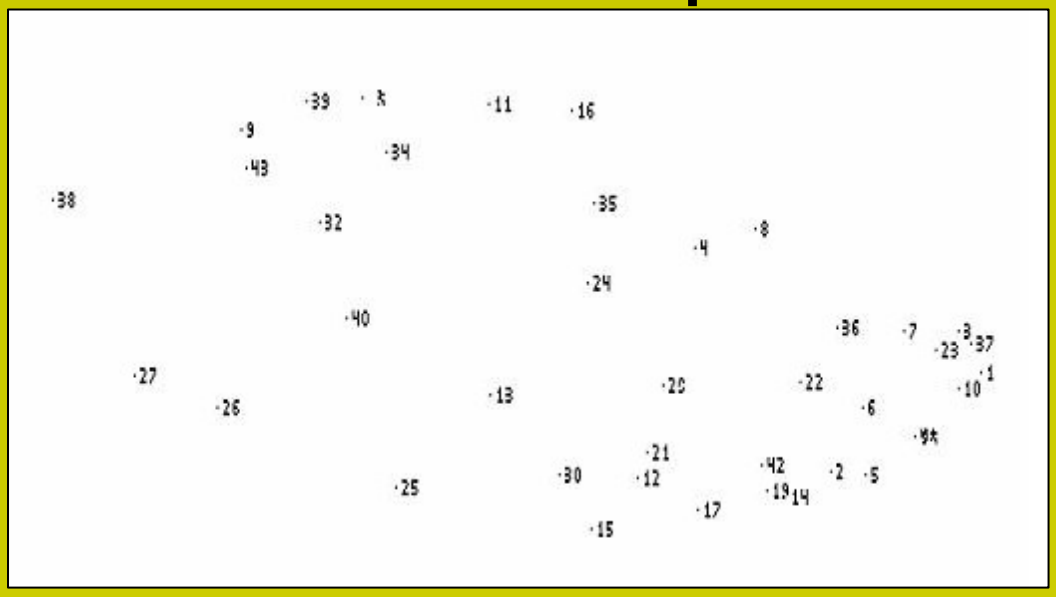
It is important to recognise that cluster analysis is not as robust a process as multi-dimensional scaling. As there is no, one, 'correct' method used to determine the number of clusters, or which points belong in which cluster (the Concept System program starts with approximately the number of clusters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

- Clusters 1 and 3 joined together;
- Statements 13 to the joined cluster 1 and 3;
- Clusters 6 and 7 joined;
- Clusters 9 and 10 joined;

In addition to these changes, participants felt the impact of losses on the whole community after bushfire and logistical issues were not represented on the concept map.

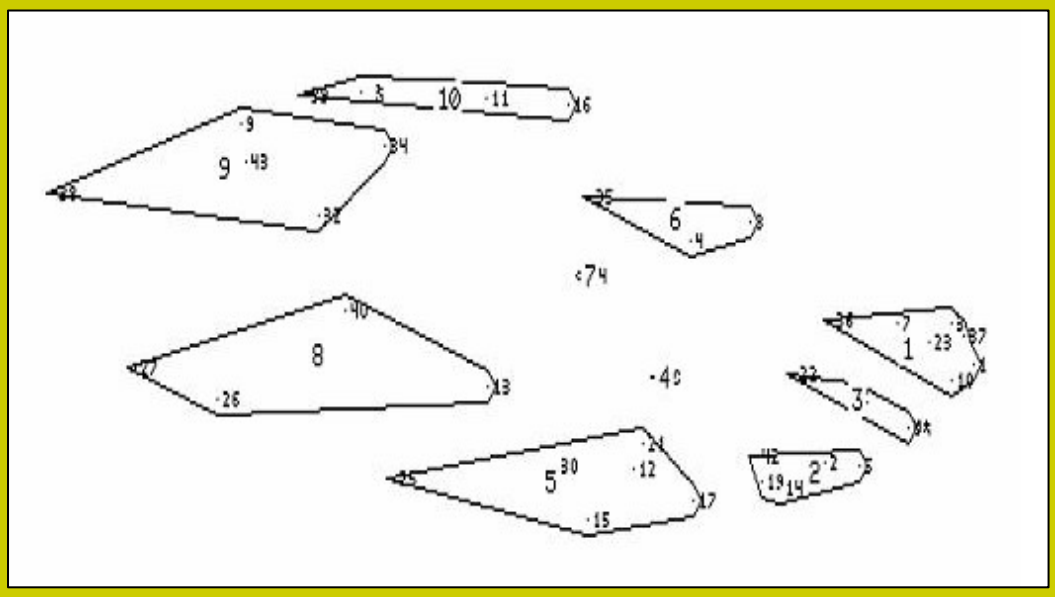
# The Concept Maps Generated During the Workshop



**Map 1**

## Cluster Names

- Cluster 1: Strategies – Education, sound targeted approaches
- Cluster 2: Education effects, outcomes
- Cluster 3: Joined to cluster 1
- Cluster 4: Preparedness (activities)
- Cluster 5: Community awareness and behaviour – collaboration and partnership
- Cluster 6: Responsibility
- Cluster 7: Joined to cluster 6
- Cluster 8: Broad, creative approach and commitment
- Cluster 9: Policy and enforcement
- Cluster 10: Land use



**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.

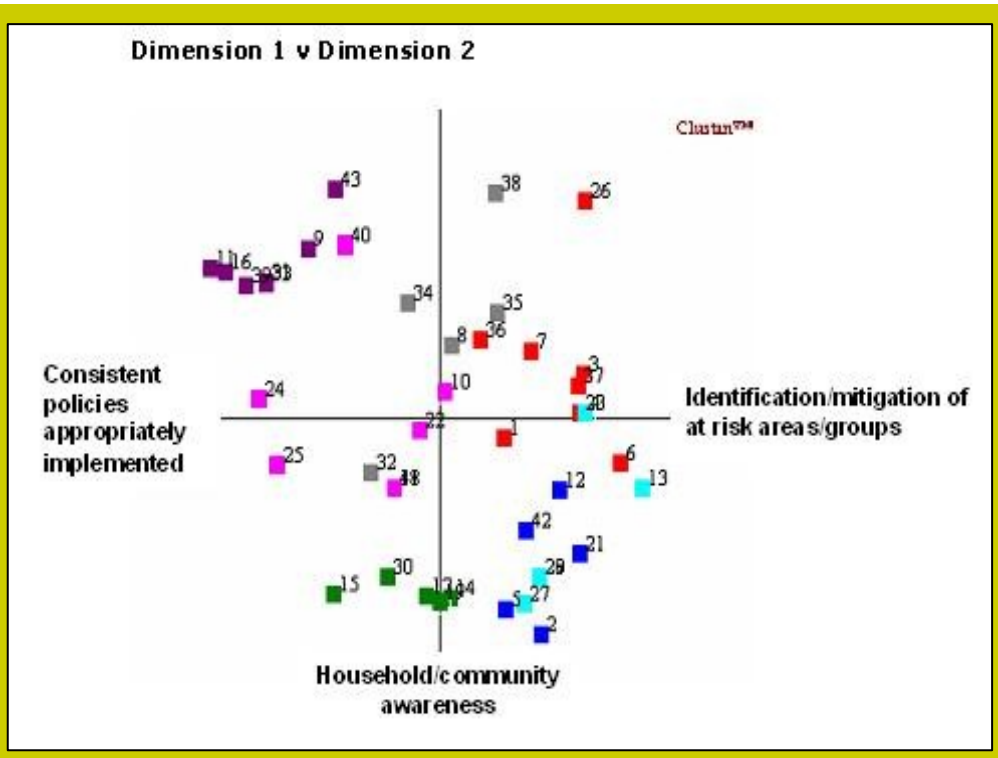
After three-dimensional concept maps had been constructed for each workshop (eleven in total) a broad range of themes related to community safety outcomes were identified. To identify and clarify these themes the researchers, as a group, sorted the pool of cluster names from individual workshops according 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):Identification/mitigation of at risk areas/ groups
- Dimension 1 (left: Maps 3 & 4): Consistent policies appropriately implemented
- Dimension 2 (top: Map 3): Due to the spread of statements a theme was not identified for this dimension
- Dimension 2 (bottom: Map 3): Household/ Community awareness
- Dimension 3 (top: Map 4): Legislation/top-down approach (rules and regulations to make people safer
- Dimension 3 (bottom: Map 4): Consistent education/information provided before and during a fire

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 ‘Consistent policies appropriately implemented ’ is one process whereby the outcome of ‘Identification/mitigation of at risk areas/ groups ’ 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.



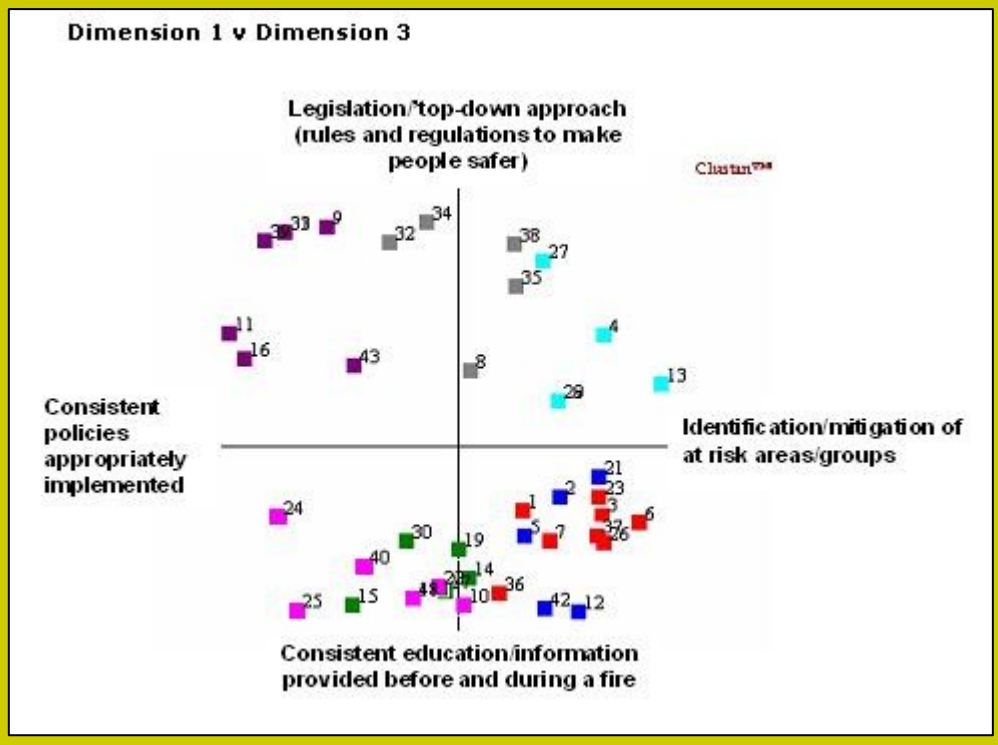

Map 3

## Cluster Names

- Cluster 1 (Statements 1, 3, 6, 7, 23, 26, 36 & 37): Appropriate education strategies
- Cluster 2 (Statements 2, 5, 12, 21 & 42): Individual understanding of fire risk and responsibility
- Cluster 3 (Statements: 14, 15, 17, 19 & 30): Agency/ Community collaboration in fire prevention and mitigation
- Cluster 4 (Statements 10, 18, 22, 41, 24, 25 & 40): Message delivery (consistent across all organisations/agencies)

# 3-Dimensional Concept Maps

- Cluster 5 (Statements 4, 13, 20, 27, 28 & 29): Planning and preparation (household and community level)
- Cluster 6 (Statements 8, 32, 34, 35 & 38): Risk mitigation
- Cluster 7 (Statements 9, 11, 16, 31, 33, 39 & 43): Land management issues are adequately addressed




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: Strategies – Education, sound targeted approaches

Cluster 2: Education effects, outcomes

Cluster 3: Joined to cluster 1

Cluster 4: Preparedness (activities)

Cluster 5: Community awareness and behaviour – collaboration and partnership

Cluster 6: Responsibility

Cluster 7: Joined to cluster 6

Cluster 8: Broad, creative approach and commitment

Cluster 9: Policy and enforcement

Cluster 10: Land use

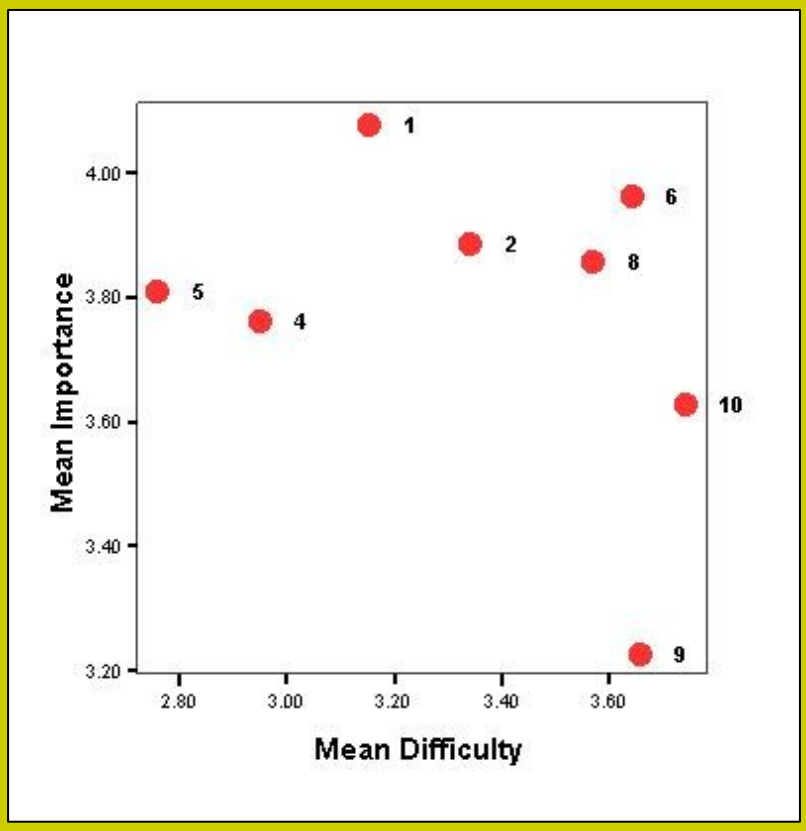



**Chart 2**

| Cluster No. | Mean Imp. | Mean Diff. |
|---|---|---|
| 1 | 4.1 | 3.2 |
| 2 | 3.9 | 3.3 |
| 4 | 3.8 | 3.0 |
| 5 | 3.8 | 2.8 |
| 6 | 4.0 | 3.6 |
| 8 | 3.9 | 3.6 |
| 9 | 3.2 | 3.7 |
| 10 | 3.6 | 3.7 |

| 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: Appropriate education strategies

Cluster 2: Individual understanding of fire risk and responsibility

Cluster 3: Agency/ Community collaboration in fire prevention and mitigation

Cluster 4: Message delivery (consistent across all organisations/agencies)

Cluster 5: Planning and preparation (household and community level)

Cluster 6: Risk mitigation

Cluster 7: Land management issues are adequately addressed

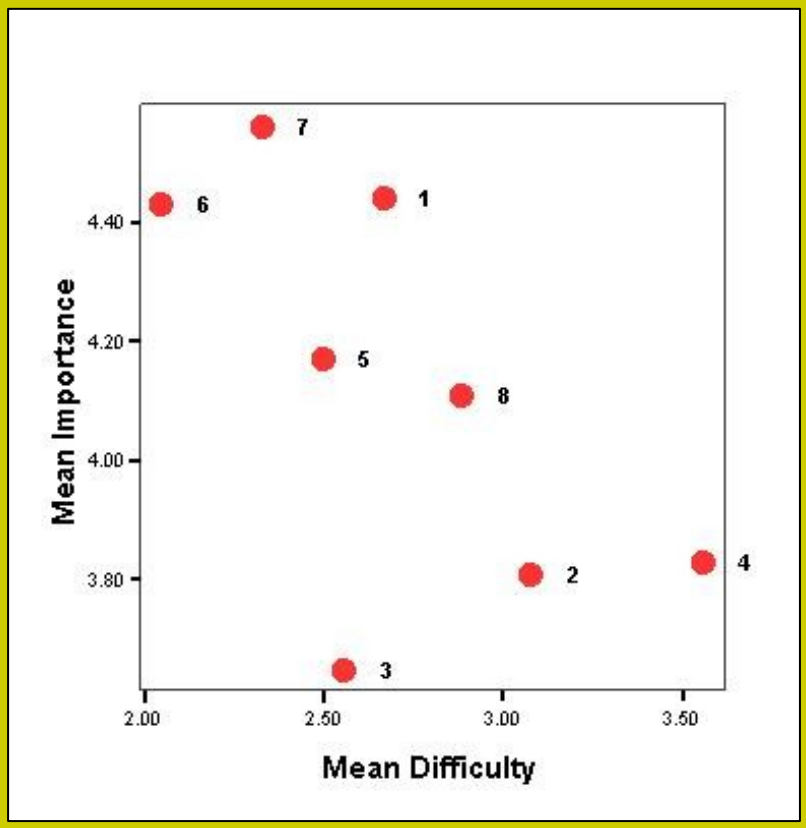



**Chart 3**

| 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 | 2.7 |

| 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

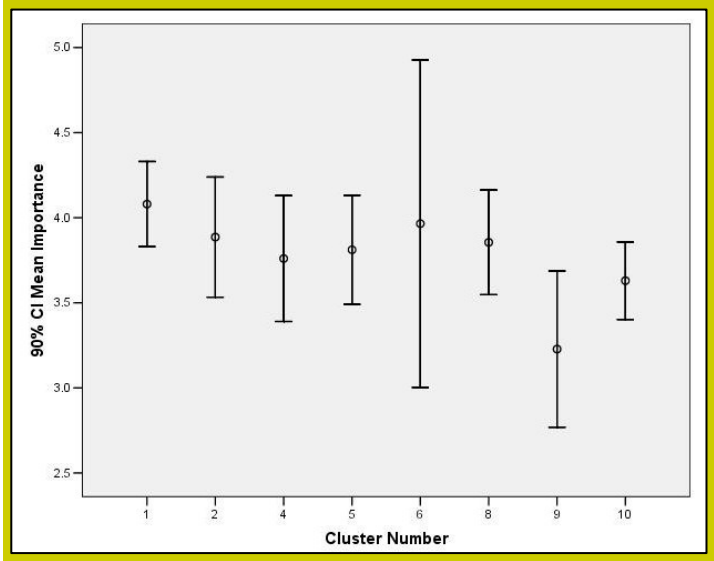



**Chart 4**

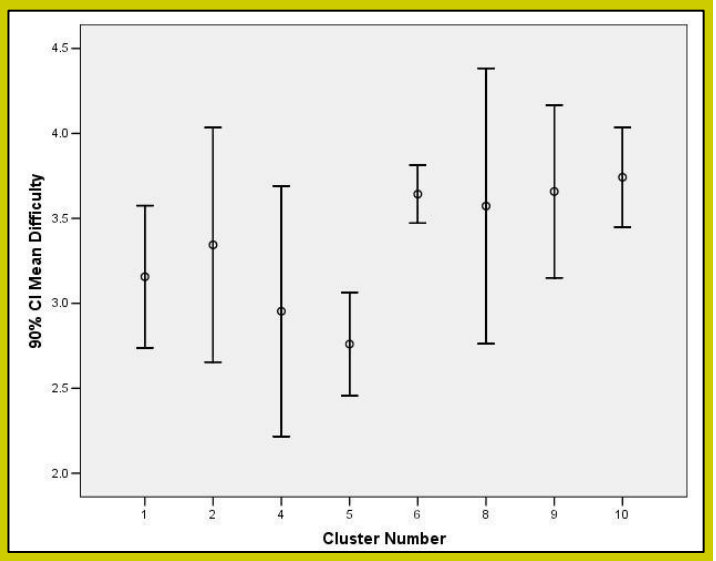



**Chart 5**

For both the two-dimensional (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 (Message delivery (consistent across all organisations/agencies)) is more difficult to achieve than cluster six (Risk mitigation) 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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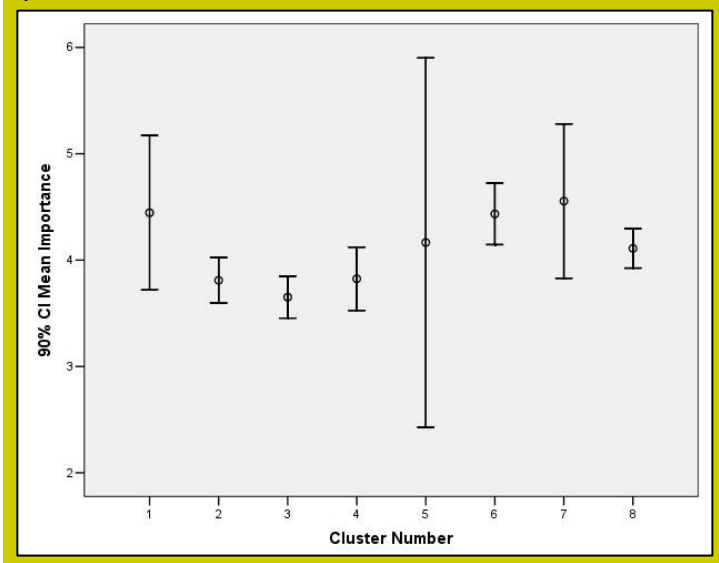


**Chart 6**

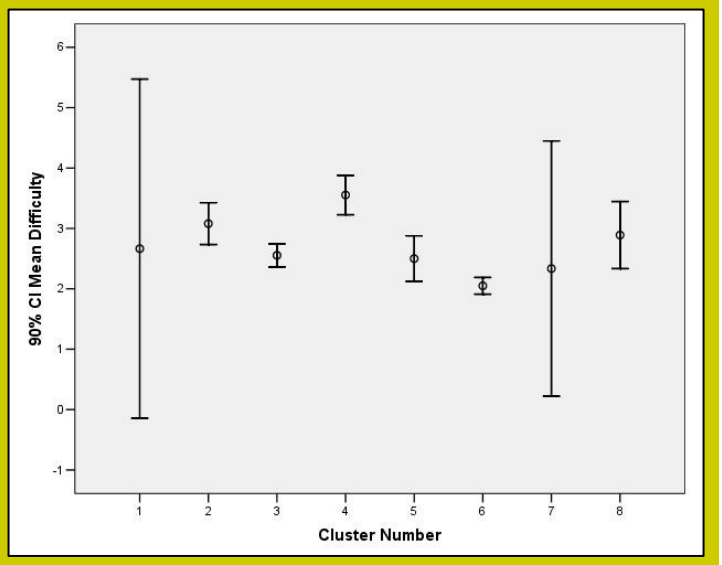


**Chart 7**