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**Published paper**

Meier, P.S. (2007) *Mind-mapping: a tool for eliciting and representing knowledge held by diverse informants*. Social Research Update, 52 . pp. 1-4.

<http://sru.soc.surrey.ac.uk/SRU52.pdf>

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## **Mind-mapping: a tool for eliciting and representing knowledge held by diverse informants**

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Acknowledgements: The MAGNET project is funded by the Engineering and Physical Sciences Research Council (EPSRC).

## **Mind-mapping: a tool for eliciting and representing knowledge held by diverse informants**

- Practical investigation of the use of mind-mapping at different stages of the research process: eliciting, representing and integrating knowledge
- EPSRC-funded MAGNET project (developing models of gun crime to inform stakeholder decision-making about interventions)
- Examples: Mind-maps were particularly useful for 1) communication within our transdisciplinary team and 2) brainstorming, interviews and focus groups with a diverse range of stakeholders.

### **Mind-mapping origins**

Whilst this paper has a more practical than theoretical orientation, we would like to start with a brief overview of the origins of the mind-mapping technique. It was first described by Tony Buzan, a psychologist and brain scientist. The method builds on the idea that the two hemispheres of the human brain are responsible for different tasks. Mind-mapping was designed to use both sides to increase memory retention and productivity (Buzan, 1976; Buzan, 1993), although critics argue that there is insufficient evidence to support this. It was first developed as a technique for note-taking and visually representing information in an interesting format without the limits or formality of standard written text. One of the key advantages of mind-mapping over standard note-taking is that the open flowing format appears to support the natural thinking process, which is thought to go on randomly and in a nonlinear way.

Since then, mapping has been used in a variety of contexts, and has developed into a tool generally used to represent an individual's or group's knowledge and ideas about one particular theme. More recently, mind-mapping software has also been developed which integrates with common project managing programmes, and is increasingly being used as a visual aid in discussing key components, tasks or risks of projects (a review of different

packages is beyond the scope of this article, but the interested reader is referred to Frey 2006 and numerous web-reviews).

Concept-maps are a variation on mind-maps, and were first introduced by Novak (Novak and Govin, 1984, Novak, 1990). These show in a graphical manner the concepts connected to a given subject together with their interrelations. Concept-maps are particularly useful to represent the - sometimes unconscious - knowledge of the individual or group drawing the map. Developed as a research tool, they have been widely used in educational, psychology and health care settings where the key task was to visualise the “mental model” of concepts that individuals use to interpret the world around them.

Both mind-maps and concept-maps have a hierarchical structure and are produced following given conventions (Novak and Govin 1984; Buzan 1993; Novak 1990; Brinkmann 2003). For mind-mapping, these involve placing the topic in the centre of the page or screen. From the subject matter primary branches are drawn for each major idea linked to the topic. Keywords indicating the major ideas are written directly onto the links. From the primary branches further sub-branches for secondary ideas (subtopics) are drawn. The principle is that ideas should move from the abstract to the concrete. In mind-mapping, each main branch builds up a unit with its sub-branches and for the sake of simplicity, connections between sub-branches of different main branches are not drawn (Brinkman 2003). Most maps involve the use of colours, images, sketches, and symbols.

In concept-maps, the topic is positioned at the top. Other concepts are arranged underneath it on several levels, again placing the more universal and abstract concepts higher, the more explicit, concrete concepts lower. Concepts should be arranged so that related ideas should be directly underneath each other. Lines are drawn from higher concepts to each of the lower concepts that they are related to; and also between concepts on the same level. The key differences between mind-maps and concept-maps are

that concept-maps allow the creator to 1) draw links between lower-order constructs on different branches and 2) label connecting lines to specify/explain the relationship between concepts (for example, such links might be “causes”, “may influence”, “is different from” etc).

### **Mind-mapping in practice: A tool for communication in a transdisciplinary team**

We are conducting an EPSRC-funded study on the applicability of mathematical modelling to inform decision making about interventions for tackling gun crime. The first challenge of the project was for us, a team with members from the fields of Criminology, Computing, Veterinary Sciences, Management, Psychology, and Sociology, to arrive at a shared understanding of the topic. Initially, steering group meetings involved the knowledge transfer from those with expertise in gun crime and criminology (the “social scientists”) to the modellers. Differences in paradigms and terminology meant that communication was difficult, so at our second team meeting we started using a flipchart to draw what would become our first mind-map of our shared understanding of gun crime. The process highlighted diverse views even amongst the social scientists, for example lack of a common definition of gun crime, diverse views on causative and contributing factors, open questions of whether and how it is related to gang culture, drug markets, youth crime or organised crime, and the range and effectiveness of preventative and intervention approaches. Later we started using mind-mapping software to organise agendas, meeting notes and circulated documents and despite the fact that none of us were familiar with mind-mapping at the start of the project, mind-maps became an important tool for facilitating internal communication.

### **Mind-mapping in practice: A tool for eliciting and representing stakeholder Knowledge**

The second phase of the project was to access and represent the explicit and implicit knowledge of a variety of stakeholders, including police officers, drug action teams, youth offending teams, academics, community groups, parents of youngsters involved in gang shootings and offenders. Our main methods

were individual interviews and focus groups. Usually, qualitative interviewing involves the use of thematic guides, mostly in the form of a more or less structured interview schedule. Even skilled interviewers can find it difficult to use these to shape interviews in such a way that interviewees have a chance to contribute to each of the main topics of interest (or at least topics that the interviewer would like them to focus on!) without unduly restricting the flow of the interviewee's communication. In our experience, interviewees often move rapidly between topics, and an anxious interviewer then tries to keep up with what has and has not been answered, mentally checks back for "skipped" question areas and this in turn can detract from the quality of the interviewing experience. Less skilled interviewers often try to force the interview back to the linear format of the interview schedule, asking questions that the interviewee thought they had already explored or that have nothing to do with their current train of thought. Such a process appears to us to limit the development of novel ideas and associations, and consequently, can lead to a loss of important information. We felt that using mapping instead of a conventional interview schedule would allow us to explore and note down the fluid pathways of information as the conversation or discussion evolves.

When deciding between mind-mapping and concept-mapping, we weighed up the value of added information on the nature of the linkage between branches and subbranches (concept maps) and of an open structure which permits easier integration of new considerations without redrawing the map (mind-maps). Our project was initially interested in identifying the key concepts to include into our models, rather than the links between them. Hence we adopted the flexible structure of the mind-map, where each contribution could be added to existing knowledge and further developed by all other stakeholders, whilst already drawn connections and hierarchies could be challenged.

Nine **interviews** were held with key stakeholders (all with direct or indirect connection with the phenomenon of gun crime). In this regard, the police clearly had a key role in understanding the phenomenon and combating it from a law enforcement perspective. Similarly, community groups also have a

stake in understanding why youngsters in their midst find themselves carrying or using guns. And somewhere in between, there are those stakeholders - either in a statutory or voluntary capacity - who are attempting to engage with those caught up in gun crime with a view to preventing. At the start of each interview, the interviewer only had a basic mind-map with headings reflecting key issues highlighted in the gun crime literature. Together with the stakeholders the interviewer explored these and added new themes, branches and sub-branches as the interview progressed. Open-ended questions asked the respondent to define the terms gun crime and gang crime and describe whether these were different, comment on the existence and nature of a gun culture, the driving forces behind gun crime and gang crime, speculate on the key factors that might prompt young people to get involved in gun crime and possible preventative/enforcement approaches.

Our **focus groups** were composed of participants representing very diverse backgrounds, bringing together, for example, community organisations, police officers and academics. The role of the focus groups was to verify the structure of the mind-maps, to make sure that no important concepts had been ignored and that irrelevant ones had not been included. The aim was that after the focus groups all stakeholders and project team would have arrived at a shared and agreed understanding of the central issues driving gun crime. The focus group facilitators brought a large sheet of paper with a hand-drawn mind-map which was based on what the team learnt from the literature, team member's expertise and the interviews. This was used as a discussion guide, and the mind-maps further evolved as the discussion progressed. Our experience was that the mind-map worked well as a focus for discussions and was equally accessible to participants from diverse backgrounds. Participants made statements such as "but I believe that we still are missing a crucial point on branch x" or "I think that x should really be listed under y" and at the end of the focus groups everyone appeared confident that the main issues had been raised and included. Fig 1 shows an example of a developing mind-map.





approaches. A paper by Jackson & Trochim (2002) describes in detail the application of a more formalised version of concept-mapping as an unconventional alternative to existing analysis techniques for open-ended survey questions, especially for research questions that are tentative in nature, aimed at developing theory, and/or developing conceptual coding schemes. Their paper also includes a useful discussion about solutions to validity and reliability concerns.

In consultation with project team members who have particular expertise in gun crime research we used focus group and interview maps and information from traditional qualitative data analysis to create a single computer-based map (the corresponding mind-map is shown in Figure 2).

### **Mind-mapping in practice: A tool for organising and sharing literature**

We also developed a separate mind-map based on the current literature in the field (references or whole documents can be attached to the relevant branches in most mind-mapping software programmes). This was a useful shared resource for the whole team and formed a very useful basis of a literature review, which could be easily structured around the major branches (Lewis et al, in review). We have also been able to gain permissions from publishers to make this mind-map, which includes relevant reports and papers, available to our stakeholders who comment very positively on the usefulness of this resource.

### **Conclusions**

*Mind-maps vs. concept maps:* Mind-maps are most valuable when the key objective is to develop a comprehensive understanding of all the key concepts involved in the subject area under investigation, whereas concept-mapping is the more appropriate method for studies focusing on the nature of the relationship between concepts. Whilst it was the right choice to use mind-maps, the social scientists amongst us still felt quite restricted by the lack of capacity for the representation of the suspected linkage between constructs.

For example stakeholders had differentiated views about the circumstances in which peers could be acting as a causative factor for gun crime, a contributing factor or in some instances, even a protective factor, and it would have been helpful to be able to reflect this in the maps.

*Hand-drawn vs. computer-based:* We preferred hand-drawn maps for participatory work, as they convey the ideas of flexibility and creativity. However, for wider sharing and web-publishing computer programmes are extremely useful and, whilst not an aim of this project, they enable drawing of very professional-looking maps (examples and reviews of different packages can be found on

[http://mindmapping.typepad.com/the\\_mind\\_mapping\\_software/](http://mindmapping.typepad.com/the_mind_mapping_software/) ).

Overall, we found mind-mapping to be a useful tool 1) for sharing ideas and documents, 2) representing combined stakeholder knowledge in an easily accessible format and 3) for organising and planning literature reviews. Mind-maps can be used for the organisation of qualitative data.

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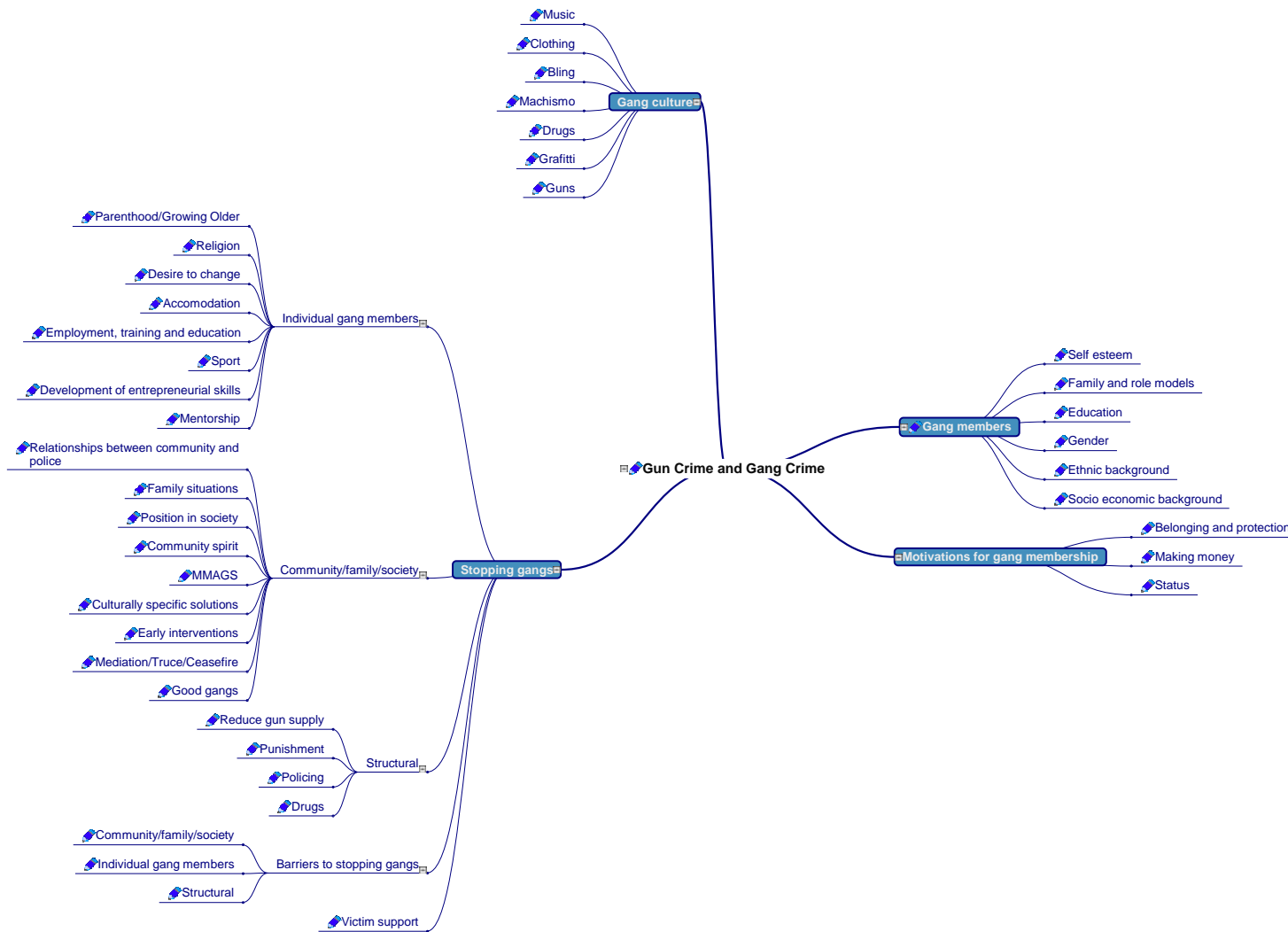


Fig 2. Mind-map representing stakeholder perceptions of Manchester Gun Crime, created in Mindgenius®. In the original, each of the sub-branches contains attached notes with quotes.