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Chapter 15

Risk communication and participatory research: 'fuzzy felt', visual games and group discussion of complex issues

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Introduction

Psychological research has shown that the general public often perceives and acts in the face of risk in ways that are very different from those responsible for assessing, managing and communicating these risks (see Fischhoff, 2008 for a review). Powell & Leiss (1997) interpreted these differences in terms of two languages of risk: a 'public' language grounded in social and intuitive knowledge (see also Lupton, 1999) and an expert or 'scientific' language grounded in scientific, specialised and statistical knowledge. 'Public' risk language takes account of qualitative aspects of the threat (e.g. the amount of control people perceive they have; how familiar/unfamiliar it seems;) whereas 'scientific' risk language is founded on formal models that define risk as the product of the likelihood of some event and the impact, value or utility of its outcome (French, Maule and Papamichail, 2009). These differences have important implications that have, until comparatively recently, been largely ignored by risk communicators. On the one hand, public audiences often have difficulty making sense of the specialised, statistical basis of professional risk assessments, so tend to ignore communications based on them, or draw conclusions that are different from those intended. Until recently, risk communicators have aimed to resolve such problems by investigating how people interpret statistical risk information, and then sought to improve the presentation of this information accordingly (e.g. Berry 2004, Gigerenzer, 2002). On the other hand, such communications often fail to address issues of concern to the multiple and varied 'publics' they address,[3] so are thought to be irrelevant and are ignored, contributing to problems of mistrust and miscommunication between experts and publics (see, e.g. Wynne 1995).

A potential solution to these difficulties can be provided by replacing this one-way 'sender to receiver' model of information transfer with a model of communication as a two way process, in which audiences take an active role in constructing the meaning of a message (Lewenstein, 1995; McQuail, 2005). This also leads to recognition of the need for partnership and dialogue between experts, policy makers, wider publics, and

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[3] Researchers in public engagement with science generally use the term 'publics' rather than 'the public' to avoid reducing the complex and variable relationships different groups of people have with science to a unitary whole.

stakeholder groups with particular interests in the issues of concern (e.g. Fischhoff, 1995). A key focus of this work has been the development of methods and processes for enabling public and stakeholder participation in risk management and decision making, such as citizen's juries and decision making workshops (Rowe and Frewer, 2005). A potential benefit of this approach is that it facilitates greater dialogue and understanding of the issues for all those involved and has the potential to improve communications by taking into account the different conceptualisations of risk. However, comparatively little attention has been paid to the question of how to apply this 'partnership' model, and the outputs of participation exercises, to develop more effective and sensitive communication of risk issues.

A notable exception to this lack of interest in partnership models is provided by the Mental Models Approach (MMA) (Morgan et al. 2002). This approach builds upon the idea that people internally represent the world in terms of small scale 'mental models' of external reality and the actions that they might take (Craik, 1943). The act of comprehension is thought to yield a mental model (Johnson-Laird, 1975) and, once established, models are used to simulate behaviours and their possible outcomes (e.g. Schwartz & Black, 1996). Importantly for the MMA this body of work also confirms that experts and novices often have different models for understanding the same issue (e.g. Gentner & Gentner, 1983). With this body of work in mind, the MMA to risk communication involves eliciting and comparing 'expert' and 'lay' mental models of a hazard to identify misunderstandings and errors in lay understanding. Comparing the identified mental models allows the researcher to then construct risk communications that rectify these shortcomings (Morgan et al. 2002). The advantages of this approach are that it has a sound theoretical base in psychology, is user-centered and that it has successfully been applied across a variety of domains (e.g. Cox et al. 2003; Niewohner, Cox, Gerrard & Pidgeon, 2004).

However, the traditional cognitivist view of knowledge which the MMA operates upon cannot take account of the ways in which even expert risk knowledge is contingent, partial and socially constructed, as a broad range of psychological research on risk has shown (see for example, Funtowicz & Ravetz, 1992). Therefore we have developed and adapted the MMA, integrating it with a social representations model of risk knowledge (Breakwell, 2001). Unlike mental models, which are seen as held solely in the individual's mind, social representations theory can account for how risk knowledge is built, held and communicated collectively, allowing greater potential for a partnership model of risk communication (Joffe, 2003). Since risk knowledge exists at both individual and social levels, our approach assumes that both perspectives are necessary to gain a comprehensive understanding of risk knowledge and communication (Cassidy and Maule, under review).

Working from this modified approach, and taking a more nuanced approach to expert/lay differences, we have adapted the MMA to investigate how risk across the

food chain is conceptualised by a range of stakeholders.[4] These groups included scientists and risk policy managers; farmers; NGO campaigners; food industry workers; and 'interested publics' for food risk[5]. In contrast to the MMA, we have sought to avoid privileging 'expert' perspectives on risk - either those of risk experts or our own.

However, our initial attempts to elicit and compare the mental models of these highly diverse groups ran into difficulties. We ran pilot in-depth interviews and focus groups on the topic and found that lay groups, and to some extent expert groups, generated outputs that were very limited in content. All groups found it hard to develop a model of the food chain and discuss the relevant risks at the same time, particularly the novice groups who were not used to organising their knowledge and talking about food risk in this way. Thus, the data generated were impoverished and failed to reflect how our participants thought about the issues involved. Thus, we needed to find a satisfactory method for eliciting the mental models of these diverse groups that could manage the very different types and degrees of experience and expertise in food chain risks that each had. To overcome this problem we developed an innovative and what proved to be highly productive visual research method for use in group interview situations.

This chapter outlines the development of this method, and demonstrates its value when investigating how different groups of people conceptualise complex situations such as risks in food production. We begin by describing the broader case study which our work contributed to, alongside our central research questions and the challenges we encountered in attempting to answer these questions. We then outline the potential of visual methods to meet these challenges, and describe the development of our approach (the 'fuzzy felt method'). We discuss participants' interactions with the method, speculate on why using images may have helped them engage with our research topic, and discuss some of the problems we encountered. Finally, we outline avenues for further enquiry in risk research and visual methods, and explore potential applications of the method in domains beyond psychological and social research.

Case study

The research was carried out as part of a larger multidisciplinary project addressing natural and social scientific approaches to managing and communicating food chain risks (Shepherd, Barker, French, Hart, Maule and Cassidy, 2006; Shepherd, 2008; Barker, Cassidy, Bayley, French, Hart, Maule, and Shepherd, in prep).[6] As described above, our research focused specifically on participatory risk communication, but in line with the wider project we employed a case study approach, looking at the food chain for two specific foods – apples and chicken. Our central research questions were:

[4] We would define a 'stakeholder' as anyone with a specific relationship to food risks, from a professional risk manager, up to and including anyone who buys and eats food.
[5] 'Interested publics' are groups likely to have a particular investment in an issue – for example in our case this included members of parent-toddler groups (see Miller, 1996)
[6] The project, known as RELU-Risk (see www.relu-risk.ac.uk) was supported by the UK Research Councils' Rural Economy and Land Use (RELU) research programme (RES-224-25-0090).

i) How do different stakeholder groups understand the risks associated with the production, distribution and consumption of food?
ii) What risks would they identify in the food chain and where would they place them?
iii) How do they think such risks should be managed and mitigated?

These questions could be rephrased as: what are the differences and similarities between different stakeholders' mental models of food chain risk?[7] Our interests in the social aspects of risk knowledge and inter-group comparisons led us to conclude that group interviewing would be a viable option: as well as the more general benefits of focus group research (Barbour and Kitzinger, 1998), it seemed that in a group of known peers, participants would be more likely to reflect frankly on the sometimes sensitive[8] risk issues we were interested in. The group context would also help mitigate the sense of putting participants 'on the spot' about their knowledge of food risk, and lessen any felt pressure to give the 'correct' answers.

Therefore we ran several pilot interview groups, addressing our research questions. As indicated above, it became apparent that the group discussions rapidly moved away from our central research questions about risk in the food chain. This was due in part to lay participants' unfamiliarity with systems of modern food production. However, we also found that both lay and some 'expert' participants had difficulty engaging with the extreme complexity of these systems and identifying and talking about interactions between different parts of them. It seemed that groups needed a great deal of intervention from the facilitator in order to stay 'on topic', which was extremely problematic for our commitment to avoid researcher framings of the interview process. To overcome these problems we explored the possibility of using visual research methods, which we believed had the potential to engage with these kinds of difficulties.

Potential of visual methods

The use of visual methods in social research is becoming increasingly common, although at present the work is scattered across many research fields and specific areas of study, leading to little methodological or intellectual coherence in how they are employed. Visual methods are probably best established in anthropology (Banks, 2001) and educational / developmental research with children (Prosser and Burke, 2007), however, as the contributions to this volume attest, they are becoming increasingly popular in general psychology research. Broadly speaking there are three main approaches to visual research: analysis of (previously produced) images, use of preselected images in interviews or focus groups to elicit discussion, and participant production of images (Prosser and Loxley, 2008).

[7] As described above, we are employing the mental models concept in tandem with social representations theory: we use the term 'mental models' in this piece as shorthand for the combined mental and social representations we have been trying to access in our research.
[8] Food risk issues are 'sensitive' not only in personal terms, but can often be commercially and politically sensitive, particularly to campaigning, policy and industry stakeholders.

As described above, our research on food chain risks needed a method which would:

i) draw out participants who regarded themselves as unfamiliar with food production and risk issues;
ii) enable participants to think about and explore in depth the complexities of the modern food production systems;
iii) allow an equal basis for comparison between participants with different degrees of familiarity, experience and expertise with food risk issues;
iv) not frame the research in terms of 'expert' understandings of food risk;
v) contribute towards a participatory approach to risk communication.

Asking participants to produce their own images (through drawing, model-making, photography or video), either prior to or during an interview situation, is a research technique which we felt had the potential to fulfil these requirements for two major reasons.

Firstly, many visual research methods work by helping participants to structure or develop their thoughts in some way. At a basic level, images provide a simple 'elicitation' role in interviews, by providing a stimulus for discussing the research topic. Participant produced images can also be helpful when working with people who are less articulate, such as young children (e.g. Dove, Everett, and Preece, 1999), or when broaching particularly sensitive subjects (Wakefield and Underwager, 1998). Gauntlett (2007) argues that the creative process can help participants to reflect more deeply on topics that they may not have thought a great deal about beforehand (which is often the case with food risks). Drawing can also help people structure and organise their thoughts more systematically, and such images can in turn play an elicitation role in group discussion. Research in this vein has used drawing to explore people's understanding of how ideas connect together, through the creation of 'concept maps'. This idea has been used extensively in educational practice (e.g. Buzan, 1995), as well as in management research, where the resulting 'rich pictures' are used to understand organisations better and therefore identify how to make them more efficient (French et al, 2005). Therefore, it seemed possible that asking participants to create images of the food chain and of food chain risks might help them explore the issue at greater depth than we had managed previously.

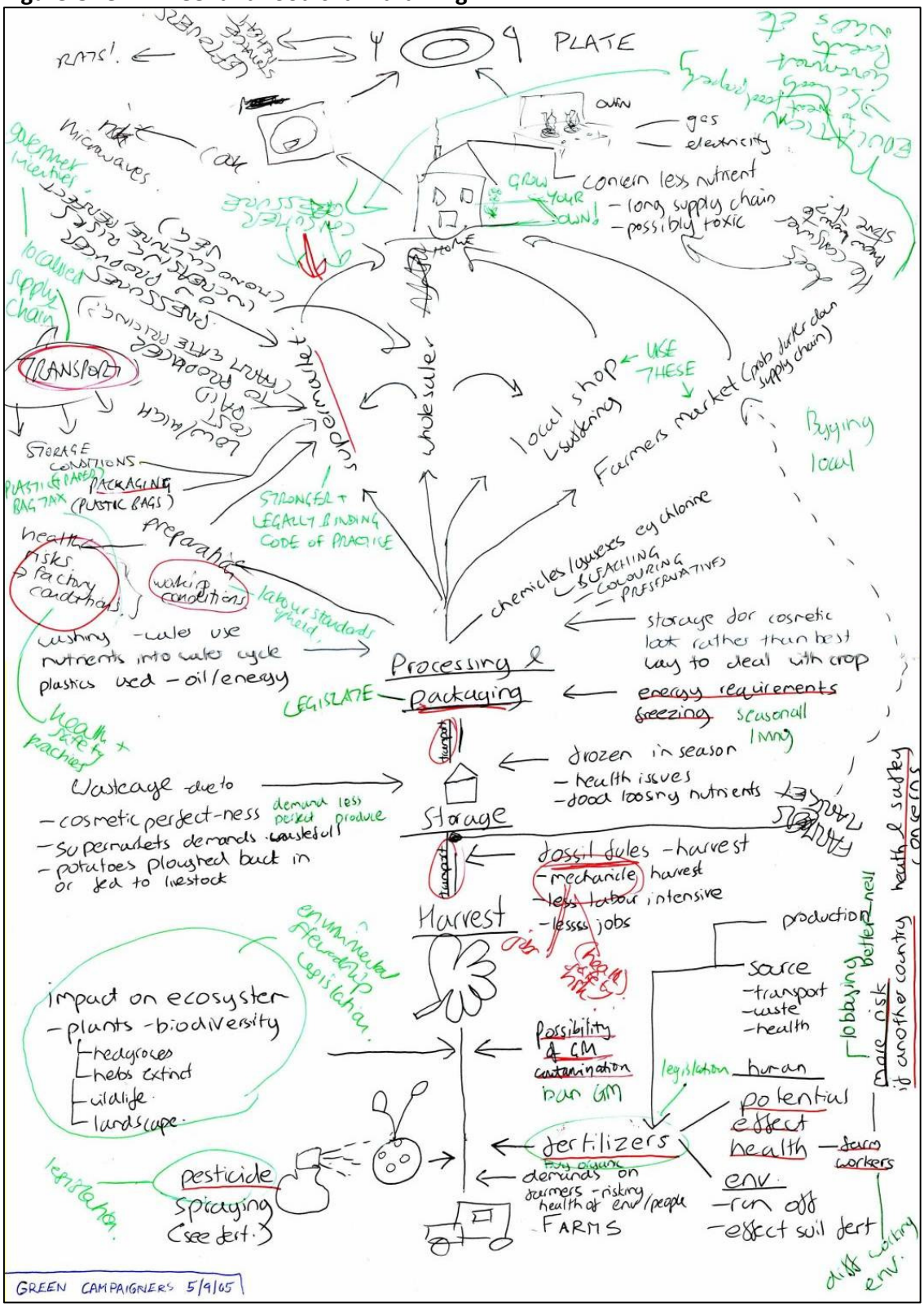
Secondly, some researchers argue that visual-based methods are inherently less directed and not filtered through researcher's expectations, because the creative activity acts in the place of researcher questioning and prompts. For this reason, these methods are also frequently utilised by practitioners of participatory research who aim to increase the meaning, validity and 'ownership' of social research for the participants themselves, which can in turn aid participants in organising collectively to effect social and political change (Kesby, 2000). Therefore, we anticipated that a visual method would help us in our stated goals of avoiding 'expert' framings of the research topic, and of working towards a participatory approach to risk communication.

Development of the 'fuzzy felt method'

As described above, we had run several pilot interview groups designed to elicit participants' mental models of food chain risks, but had run into difficulties in engaging with the research topic, and in particular with exploring the complexities of contemporary systems of food production. From reading the literature on visual research methods, it seemed that using images, and in particular asking participants to draw while thinking about food chain risk, might help us overcome these problems. Therefore a second pilot study was run, in which small groups (2-4) of participants were presented with a piece of A3 paper and asked to draw an image of the food chain for a particular item– the series of connections any food goes through on its journey from 'farm to plate'. Five trial groups were run, each with a different type of participant (farmers; food scientists; green campaigners; young professionals; parents of young children). Once the picture was complete, participants were then asked to use red pens to identify and locate what they thought the main risks were on that food chain, and finally to use green pens to identify how and where those risks could be managed.

We found this approach to be partially successful: the task helped participants focus on our central issue of enquiry (risk in the food chain), and supported them in a process of 'thoughtful reflection' about the complex issues at hand' (Gauntlett and Holzworth, 2006; p2). The resulting images were complex, interesting and 'rich' in their content (see fig. 1 for an example) and group discussion was longer, more developed and much more focused on the research topic than in the earlier pilot. Crucially, we also found that *very little intervention* was required from the interviewer, aside from the central prompts asking for an image of the food chain, and for the key risks and mitigations present. However, we found that participants' interactions with the drawing task were variable, both within and between the groups: while some took to the idea well, drew lots and talked more, others seemed wary and were reluctant to engage in the drawing activity. There were two primary reasons for this reluctance: participants expressed embarrassment at doing something 'artistic' without considering themselves to be talented at that activity, especially in a group context; and confusion / scepticism at how the task comprised a valid piece of research. In addition, once engaged in the task, the degree to which people used drawing/images was highly variable, with some choosing to mostly talk, others to write 'labels' but not use images, and others to draw pictures. This variability presented problems for how representative the data was of all group members, as well as raising concerns for how to analyse validly and interpret the data across groups in order to answer our primary research questions.

Figure One – A freehand food chain drawing



We did, however, notice some consistency in the images produced – all the groups created some sort of interconnected network to represent the food chain, with specific elements, usually objects, places or processes (e.g. tractors; chickens; warehouses), at the node points of these networks. Inspired by this and the child's game, 'Fuzzy Felt'[9] - which involves arranging a series of pre-cut felt shapes onto a textured board to create larger 'scene' pictures - a version of the game was developed for use in our group interviewing. This involved sticking icons of the food chain elements onto a large piece of paper and connecting them with hand-drawn lines. As with Gauntlett's (2007) research using Lego figures to explore identity issues, we anticipated that such an activity would help people engage with food risks in a creative, but less challenging, more 'playlike' fashion. In addition, we hoped that this would help address some of the problems we had encountered with freehand drawing. By providing the activity with some structure, we hoped to overcome participants' reluctance to draw, and to make the resulting data on their mental models of food chain risk a little clearer and more easily comparable.

List of participant-generated food chain elements

General	**Apple food chain specific**	**Chicken food chain specific**
Farm	Apple	Slaughter
Garden/allotment	Drink	Chicken (live)
Factory	Apple tree	Chicken (meat)
Warehouse		
Lorry		
Car		
Ship		
Plane		
Farm machinery		
Kitchen preparation		
Kitchen storage		
Processed product		
Plate		
Supermarket		
Small shop		
Catering/restaurant		
Market		
Wholesale		
Blank		

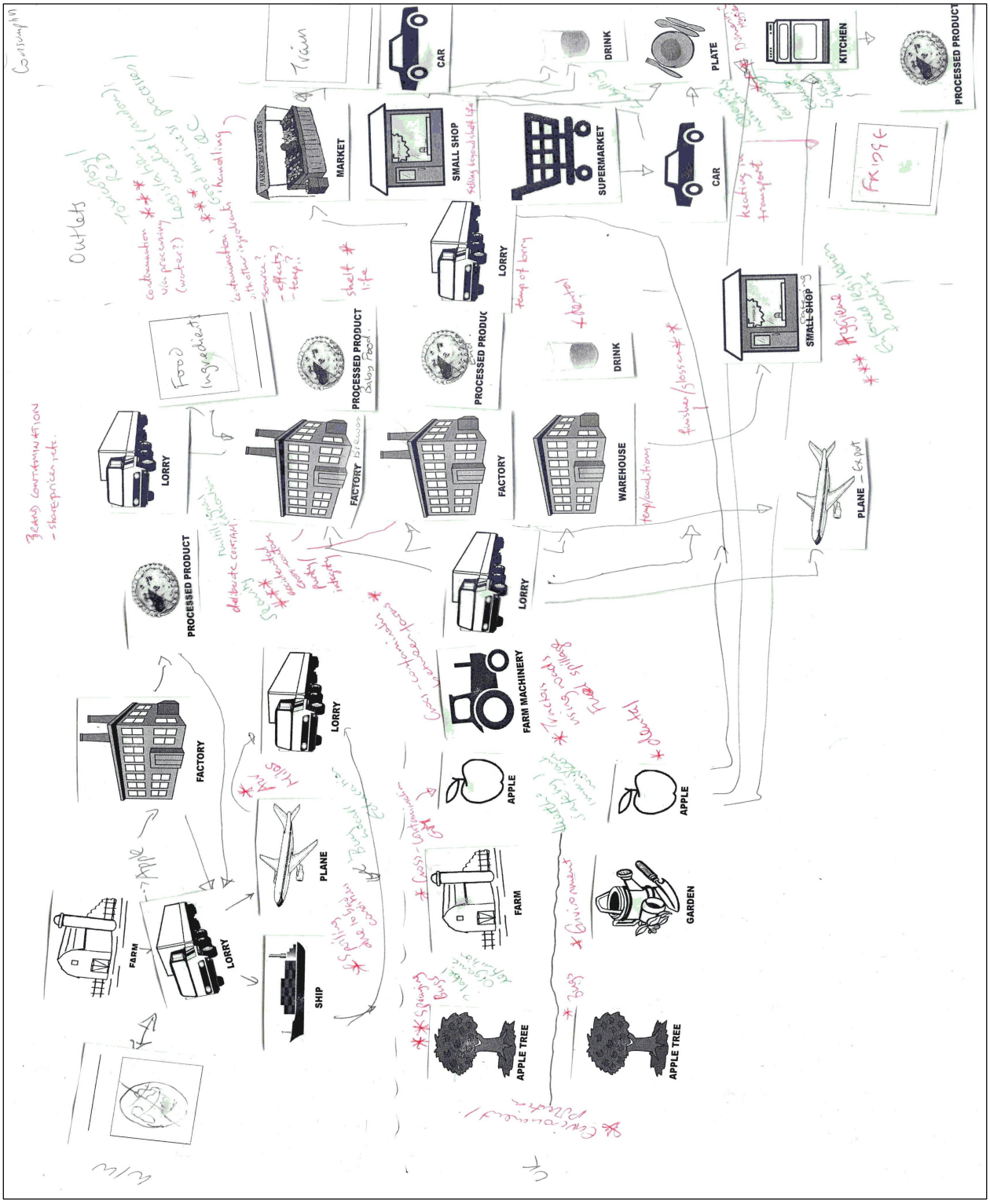
[9] See http://www.fuzzyfelt.com/load.swf for further details of the game.

In order to ensure that this framework remained participant generated, the freehand drawings from the pilot study were used to generate a list of food chain elements, which in turn were converted into a series of 'clipart' style images (mostly publicly licensed images obtained from the Internet, with a few researcher generated images in the same style)[10]. The revised interview procedure went as follows. Small groups of peers (2-6 members) were presented with a piece of A3 paper on a drawing board, with the food chain elements arranged around the edge in the form of labelled, printed pictures on small pieces of paper mounted on blutack. Several 'blank' images were also available so that groups had the option to create new elements if they wished. Each participant was given black, red and green pens. As with the earlier freehand pilot, the group was asked to work together to create an image of the food chain (either apples or chicken), using the provided 'element' pictures and the black pens. Once they agreed that this was complete, they were asked to use the red pens to write on their image the risks they thought were involved in their food chain, locating them in the image. Once this exercise was complete, they were asked use the green pens to identify possible risk management actions that could and should be taken to mitigate the risks they had already identified. As a closing question, participants were asked about sources of information about food risk (Where did you find out/hear about these things? Where would you go to find out more?).

As in the pilot study, it was made clear to participants that we were interested "what *you think* happens", rather than what participants might know for sure. Discussions amongst the group while they worked on this were recorded and transcribed, and these transcripts were analysed alongside the images produced during the interview session. An example of the type of image produced in this second version of the task is reproduced below in Figure Two. Thus the resulting images provide an effective way of capturing how particular stakeholder groups conceptualise the food chain, the associated risks and how these risks may be mitigated. As such they not only embody some of the defining features of mental models e.g. the principle of iconicity stating that a mental model has a structure that corresponds to the known structure of what it represents (Johnson-Laird & Byrne, 1991), but also fulfil the needs of the MMA by providing a method for capturing and comparing the mental models of experts, the public and other key stakeholders.

[10] Dillon (2006) has argued that such 'clipart' images have strong continuities with earlier styles of illustration, and may provide a rich seam for researching social representations in and of themselves. As such, our use of this form of image may have facilitated the process of eliciting further mental/social representations.

Figure Two – an example 'fuzzy felt' style food chain image



Interpretation and analysis

Since the method had been designed primarily to facilitate group discussions of food chain risks, it was paramount that transcripts of the group interview sessions were analysed directly alongside the images produced by the groups. The analysis comprised a two stage process, each asking different questions of the data, which we will describe as the 'descriptive' and 'interpretive' stages of data analysis. The initial 'descriptive' analysis was designed to answer some of our more basic research questions, i.e. what, where and how our stakeholder groups defined risk, and risk management in the food chain. To do this, we carried out a simple content analysis on transcripts and images alike, coding for relatively straightforward features (what risks, what mitigations, where in the food chain?). As an adjunct to this content analysis, the images were also coded for various structural features of the food chains that had been produced (e.g. the ratio of 'risks' to 'mitigations', the number and type of icons, the number of linkages between icons) and the overall 'shape' (e.g. the number of routes and branches).

However, we felt that such an analysis on its own could not hope to fully answer our research questions, as it could not access more complex issues surrounding the meaning of the kinds of risks identified, how the groups negotiated definitions of what constitutes 'food risk'; their broader attitudes to different modes of food production; to risk management and responsibility; what they considered to be 'good/bad' food; and their relationships and attitudes to the other stakeholders in food production. Therefore, a more conventional, in-depth, qualitative 'interpretive' analysis of the interview transcripts was carried out, addressing the above questions as well as drawing out the major themes of discussion in the interview groups. This second stage of analysis focused more upon the textual rather than visual data, although coding was carried out in close reference to the visual images. In part this was due to the limitations of the qualitative data analysis software in use (NVivo), but also because we felt that the 'standardised' nature of the images (i.e. the use of clipart) meant the visual data was not sufficiently 'rich' (i.e. complex and open to the same level of interpretation as the transcripts) to warrant qualitative analysis at this depth.

Presentation and interpretation of our findings lies outside the scope of this chapter (see Cassidy & Maule, in preparation for a full description of these). However, the analyses showed that all stakeholder groups were aware of a broad range of processes and procedures that take place between the farm and the point of consumption. Groups conceptualised the food chain, and the risk issues involved, in strikingly different ways. For example, environment/food campaigners and members of the public tended to divide food production into two food chains, mainstream and 'alternative' (organic, fair trade, locally sourced) production, associated with very different levels of risk. In contrast, scientists, farmers and food industry representatives tended to see food production as a unified system, incorporating all modes of production. Also, participants had very different understandings of what constituted 'risk' in the food chain. For scientists and risk managers, food risks were defined exclusively as factors that cause harm when ingesting a foodstuff. However other stakeholders included broader risk issues relevant to their own

interests and values, such as economic risks (farmers and food industry representatives) or environmental issues (NGO campaigners). Finally, we found that food industry 'insiders' (scientists, risk managers, food industry representatives and farmers) understood food risks in the context of risk mitigation systems (good management, regulation, inspection and assurance schemes), while other stakeholders showed little awareness of such systems.

Discussion

Running small group interviews structured around a 'fuzzy felt' style activity proved to be significantly more productive and useful, not only in terms of our research objectives, but also, it seemed, for the experiences of the research participants themselves. While we found that participants were often initially puzzled or wary of the task they were asked to undertake, the majority quickly warmed to it as they became engaged in the activity. At times, it was palpable that participants were actively enjoying the chance to 'play' in a situation they had obviously expected to be quite formal.

> M1: also it could go to wholesale as well down here, with a lorry... well it doesn't matter actually, and that can go then to the small shop, wholesale to small shop and catering... and this can also go to supermarket and catering up here to really. Sorry, I've taken over here, I love this!
>
> *[laughter]*
>
> M2: I'll see if I can get you an Etch-A-Sketch!
>
> (Food industry association, 16/10/06)

Other participants directly commented on how the activity was helping them to think about, and focus on, food risks in new and different ways – interestingly this occurred in groups with both low and high levels of familiarity with the issues at stake.

> F2: I think for these sort of sources, these risks, that would be from a number of outbreaks, and you can see what causes them. But actually to put the whole chain together is quite difficult, 'cause often you only ever see little bits of it. It's only because you've got experience of lots of different areas that you actually see the whole thing, you know, if you see someone at this end, they just say. Well, we buy birds from a wholesalers, this is what we do with them.
>
> M1: that's right, yes. What are also doing, is surmising that there is actually a linkage, a continuum between over there and all the way down through going into somebody's mouth over there.
> (Food scientists, 01/03/06)

We speculate that this effect shows how producing an image can facilitate participants' thinking about the issue at hand, helping them to explore their ideas in much greater depth than they may have ever done beforehand. It may also be possible that, particularly with

the kind of highly complex system we were asking people to think about, that the image acted as a memory aid, providing a record and summary of the groups' thoughts that they could continue to refer back to throughout the interview. It is probable that this is why we found that facilitator intervention could be kept to a minimum.

However, several problems with the method did arise at different stages of the research process. While the majority of participants interacted positively with the 'fuzzy felt' task, their was still a significant minority who did not - either by refusing to fully engage in the drawing activity, or by making it clear that they did not consider it to be 'serious' or authoritative enough to constitute legitimate research. The problems around reluctance to engage in the creative activity of freehand drawing were therefore obviously mitigated, but certainly not eliminated by the use of the 'fuzzy felt' exercise. Furthermore, we found that sometimes a single person would be nominated 'scribe', either via seniority or willingness to draw, and other group members would only contribute verbally – this may bias the findings towards one individual's viewpoint. As with the earlier drawing stage, we could not see any obvious pattern in how particular groups or individuals interacted with the methodology, an issue which warrants further investigation. We also found that the textual data arising from group discussions to be somewhat 'patchy', whereby long periods of very instrumental conversation about creating the image (e.g., 'Let's put this here', 'OK', 'But how does this connect to that?') were interspersed with patches of richer material in which issues such as risk definition were discussed. While this was not necessarily a problem (we did find answers to our research questions), it meant that sections of some of the interview transcripts were not coded. As alluded to above, the imposition of structure upon the research process by using the 'fuzzy felt' method also led to some (probably inevitable) loss of richness in the visual data. Furthermore, although we attempted to use 'neutral' looking images for use in the procedure and to label them as such, these choices would not have been impartial, especially in the case of images we had to produce ourselves.[11] For our study, we considered the trade-off between richness and reliability of data to be worthwhile: however it may not be so for other research. Certainly further work involving freehand drawing of food risks is likely to prove to be a highly productive avenue of enquiry.

Finally, as indicated in the previous section, we encountered some problems while developing a reliable and valid strategy for analysis of the resulting verbal and visual data. We are satisfied that the analytical approach finally adopted was sufficiently robust, but we did find it to be very demanding of researcher time and resources, and speculate as to whether this is a general issue with the analysis of visual data, or visual data in combination with texts/transcripts. Although the method worked well to minimise researcher influence in the interview situation, this of course did not carry through to data analysis, which was as subject to researcher bias as any piece of qualitative research, and was combated in the usual ways, e.g. through inter-coder checking. A potential extension to the methodology which could increase its validity might involve a further research stage in which participant

[11] For example, the icon for 'slaughter' created was a neutral box with a live chicken going in one side and a chicken carcass coming out the other. This was commented upon several times as being quite funny, but highlights the sanitised nature of the choice – outcomes could have been quite different if a more 'realistic' or 'emotive' image had been used.

groups reconvene, and the completed and analysed 'fuzzy felt' images are discussed, giving participants the opportunity to offer their own interpretations of the model. In a participatory context, a joint session involving representatives from several different groups in which the completed images from those groups are discussed, might prove to be a highly fruitful approach to fostering dialogue and mutual understanding between them.

Overall, the 'fuzzy felt' method has considerable potential to be developed into a powerful and flexible research tool for use in group interviewing. As seen in our work on food chain risks, it provides participants with a support structure around which they can explore their thoughts in-depth about the issue at hand, whilst simultaneously reducing researcher influence upon the interview process. This combination of features means that the method is particularly useful in research situations where a complex system or issue is under discussion; when comparing participants who have differing levels of familiarity or ease with the topic at hand; and when researcher framings of the interview is to be avoided. The method can also be of potential use in contexts beyond the relatively restricted one of social research methodology. For example, colleagues in the RELU-Risk project have developed a computerised version of the 'fuzzy felt' method, designed for use as a communication tool for exploring food chain risk issues (Zhang, 2007, Zhang, 2008). 'Fuzzy felt' may also have other applications where its potential as a facilitation aid, rather than data gathering tool, could be exploited, for example in classroom discussions and public participation events. A potential model for this might be provided by the Democs card games, which use a series of cards with themed images to stimulate discussion in classrooms and small group participatory exercises (Walker and Higginson, 2003; Duensing, Smith and Windale, 2006).[12]

We have carried out the initial development and testing of this unusual new visual method in the context of some very specific research challenges. Although the method has worked well for this particular project, at present not enough is known about how and why it has helped our participants discuss food chain risks. What is needed next is further research to investigate in detail how 'fuzzy felt' method works (and when it doesn't and why); how it might be useful for research in domains beyond that of food, knowledge and risk; and to further explore its potential for application in other areas beyond research such as risk/science communication practice, education and public participation.

Bibliography

Banks, M. (2001) *Visual Methods in Social Research*. Sage: London.

Barbour, R.S. and Kitzinger, J. (1998) *Developing Focus Group Research: Politics, Theory and Practice*. Sage: London.

Barker, G.C., Cassidy, A., Bayley, C., French, S., Hart, A., Maule, J. and Shepherd, R. 'Can stakeholder perspectives be used effectively in managing food chain risks?' In preparation for *Risk Analysis*.

Breakwell, G. (2001) 'Mental models and social representations of hazards: the significance of identity processes' *Journal of Risk Research*, 4(4): 341-51.

[12] See also the Democs website: http://www.neweconomics.org/gen/democs.aspx

Buzan, T. (1995) *The MindMap Book*. BBC Books: London.
Cassidy, A. and Maule, A.J. 'Building Partnership in Risk Communication: evaluating and developing the mental models approach' Under revision for *Journal of Risk Research*.
Cassidy, A. and Maule, J. 'So what do you mean by 'risk', anyway? UK stakeholder knowledge of food chain risks' In preparation for *Health, Risk and Society*.
Craik, K. (1943) *The Nature of Explanation*. Cambridge: Cambridge University Press.
Dillon, G.L. (2006) 'Clipart images as commonsense categories' *Visual Communication*, 5(3): 287-306.
Dove, J.E., Everett, A. and Preece, P.F.W. (1999) 'Exploring a hydrological concept through children's drawings' *International Journal of Science Education*, 21(5): 485-97.
Duensing, S., Smith, K. and Windale, M. (2006) *Just like a bed of roses: Democs and discussion based learning in the classroom*. New Economics Foundation: London. Downloaded from: http://www.neweconomics.org/gen/uploads/felpdx23mw24ilm35senee4521042006140824.pdf on 11/11/08.
Fischoff, B. (1995) 'Risk Perception and Communication Unplugged: Twenty Years of Process' *Risk Analysis*, 15(2): 137-45.
French, S., Maule, AJ, and Mythen, G (2005) Soft modelling in risk communication and management: examples in handling food risk, *Journal of the Operational Research Society*, 56(8): 879-888.
French, S., Maule, A. J. & Papamichail N (2009) Decision behaviour, analysis and support. Cambridge: Cambridge University Press.
Funtowicz, S O & Ravetz, J R (1992). Three type of risk assessment and the emergence of post-normal science. In S Krimsky & D Golding (Eds) *Social theories of risk.* Praeger: Westport, USA.
Gauntlett, D. and Holzwarth, P. (2006) 'Creative and visual methods for exploring identities – A conversation between David Gauntlett and Peter Holzworth' *Visual Studies* 21(1): 82-91.
Gauntlett, D. (2007) *Creative Explorations: New approaches to identities and audiences*. Routledge: London.
Gentner, D., & Gentner, D. R. (1983) Flowing waters or teaming crowds: Mental models of electricity. In D. Gentner & A. L. Stevens (Eds) Mental models. Hillsdale NJ: Erlbaum.
Gigerenzer, G. (2002). Reckoning with Risk: Learning to Live with Uncertainty. Penguin Books: Harmondsworth.
Joffe, H. (2003) 'Risk: From perception to social representation' *British Journal of Social Psychology*, 42: 55-73.
Johnson-Laird, P. N. (1975). Models of deduction. In R. Falmagne (Ed) Reasoning: Representation and process. Springdale, NJ: Erlbaum.
Johnson-Laird, P. N. & Byrne, R. M. J. (1991). Deduction. Hillsdale, NJ: Erlbaum.
Kesby, M. (2000) 'Participatory diagramming: deploying qualitative methods through an action research epistemology' *Area*, 32: 423-35.
Lewenstein, B (1995) 'Science and the Media' In: Jasanoff, S. Markle, GE, Peterson, JC and Pinch, T (eds.) *Handbook of Science and Technology Studies*. Thousand Oaks, CA: Sage.
McQuail, D. (2005) *McQuail's Mass Communication Theory* (Fifth Edition), Sage: London.

Miller, J.D. (1986) 'Reaching the attentive and interested publics for science' In: Friedman, SL., Dunwoody, S. and Rogers, C.L. (eds.) *Scientists and journalists: reporting science as news*. Free Press: New York.

Morgan, M.G., Fischoff, B., Bostrom, A. and Atman, C.J. (2002) *Risk Communication: a mental models approach.* Cambridge: Cambridge University Press.

Niewohner, J., Cox, P.,Gerrard, S. & Pidgeon, N. (2004) Evaluating the efficacy of a mental models approach for improving occupational chemical risk protection. Risk Analysis, 24, 349 – 361.

Prosser, J., and Burke, C (2007). "Childlike perspectives through image-based educational research" in: J. G. Knowles, A. Cole (Ed.) *Handbook of the arts in qualitative research: perspectives, methodologies, examples and issues.*. Oxford University Press.

Prosser, J. and Loxley, A. (2008) 'Introducing Visual Methods' *ESRC National Centre for Research Methods Review Paper*. National Centre for Research Methods: University of Southampton.

Rowe, G. and Frewer, L. (2005) 'A Typology of Public Engagement Mechanisms' *Science, Technology & Human Values*, 30(2): 251-90.

Shepherd, R., Barker, G., French, S., Hart, A., Maule, J., and Cassidy, A. (2006). 'Managing food chain risks: integrating technical and stakeholder perspectives on uncertainty'. *Journal of Agricultural Economics*, 57, 2: 311-327.

Shepherd, R. (2008) 'Involving the public and stakeholders in the evaluation of food risks' *Trends in Food Science & Technology,* 19: 234-39.

Schwartz, D., & Black, J. B. (1996) Analog imagery in mental model reasoning: Depictive models. Cognitive Psychology, 30, 154 – 219.

Wakefield, H., & Underwager, R. (1988). The application of images in child abuse investigations. In J. Prosser (Ed.), *Image-Based Research: A Sourcebook for Qualitative Researchers* (pp. 176-194). London: Falmer Press, Ltd.

Walker, P. and Higginson, S. (2003) *So you're using a card game to make policy recommendations?* New Economics Foundation: London. Downloaded from: http://www.neweconomics.org/gen/uploads/4o3vno55cn3lgu55it3n0pau25032004150620.pdf on 11/11/08.

Wynne, B (1995) 'Public Understanding of Science'. In: Jasanoff, S, Markle, GE, Peterson, JC and Pinch, T (eds.) *Handbook of Science and Technology Studies*. Thousand Oaks, CA: Sage.

Zhang, N. (2007) *Interactive Food Chain Tool*. Available at: http://wintest.humanities.manchester.ac.uk/Mzyxdnz2/WebApplication1/tools/default.aspx University of Manchester: Manchester.

Zhang, N. (2008). *Doctoral Thesis: Evaluation of e-Participation*. Manchester Business School, University of Manchester: Manchester.