# Using Repertory Grid in an Assessment of Impression Formation

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## Abstract

*In the work described here we are concerned with support for creative knowledge workers. Our research deals with how computer systems can be used to assist in the formation of the close collaborative relationships that are common in this work domain. Here we describe the background behind our interest in impression formation as well as how and why we have applied the repertory grid technique in this research. The results of a series of interviews are reviewed and we comment on the effectiveness of the method used.*

### Keywords

Repertory grid; impression formation, design, creativity support tools

## INTRODUCTION

We are interested here in the development of support tools for collaboration in the course of creative work, specifically design. We are particularly interested in how designers find suitable people to work with and how collaborative relationships initially form. When we visit a person's office we are presented with a whole host of information about them: certificates on the wall, family photographs perhaps, their collection of books, the way that they are dressed, the general impression of tidiness or otherwise and so on. This information is available to supplement the words that the person speaks in our assessment of what they are like, what they are interested in, what they know about, how busy they are and what they are doing right now for example. Of course, when we 'meet' the person using some remote communications tool, this sort of peripheral information is often absent. Our interest is in how we might go about sharing some of this information with potential remote collaborators and what issues might arise. To this end, we have conducted a set of interviews using the repertory grid technique which will be described in more detail below. Essentially, the interviews involved the subjects looking at a large-scale photograph of a person's workplace and talking about what they thought the person might be like and what their situation might be. (For reasons of confidentiality, the image used in the interviews will not be shown in this paper). Our aim in this investigation was to start to understand what inferences the subjects drew about the person from elements in the image.

## BACKGROUND

### The Task Domain

In the work described here, we are interested in providing support for people engaged in creative work, specifically design. Design, in this instance, is characterized by the need to find solutions to ill-structured problems: Restrepo and Christiaans suggest that design problems as well as not being subject to systematization, are characteristically incomplete and vague (Restrepo & Christiaans 2003). A problem can be considered well-structured when three things about it are known: the starting condition, the desired goal state and the means to get from one to the other (Goel 1992; Goel 1995). In an ill-structured problem, on the other hand, one or more of these elements is missing and this is typical of creative work in general, and of design in particular. It has been noted that it is often the case that a designer must spend a considerable portion of their time in merely defining the problem to be solved before they can begin to work on the solution itself (Lawson 1990). Schön (1983) describes this activity as problem setting: "the process by

which we define the decision to be made, the ends to be achieved, the means which may be chosen" and he makes a distinction between this and problem solving.

A typical problem of the ill-structured type we are concerned with here might be stated as "make it safer for children to cross the road". In this case, the starting condition is not known: it is not clear which children we are dealing with and what they are like, which road and what the specific issues are that make crossing unsafe at present. In addition to this, it is not clear under what circumstances the problem could be considered to be solved: should the children be able to cross this road in perfect safety or should they be able to get to their destination without going near the road at all? In addition to this, in order to begin to work on this problem, we would need to clarify what sorts of solutions would be appropriate: a patrolled crossing, a programme of education in schools, or a bridge for example. Each of these would require a very different approach to the problem and the exercising of different skills.

It would not be correct to say that a well-structured problem is necessarily easier to solve than an ill-structured one. Indeed, many extremely difficult problems could be described as well structured. It is the difference in the approach that is required that sets apart the problems we are concerned with here. Instead of making some plan of the work to be done, and the sub-problems to be tackled, it is often necessary to adopt a much more exploratory style, feeling the way towards an understanding of the issues at stake. This is typified, in the world of design, by sketching activities (Goel 1995). The designer's sketch serves not just as a tool for communication with other people, but also as a way for the designer, in a sense, to communicate with him or herself. In one passage, Schön (1992) says of this sort of activity: "A designer sees, moves and sees again. Working in some visual medium ........ the designer sees what is 'there' in some representation of a site, draws in relation to it, and sees what he/she has drawn, thereby informing further drawing." The designer, then, is using the sketch as a tool to explore the problem space. The sketch here is acting as a sort of model: a way of gaining increased understanding by means of 'what-if' style investigations.

Design nearly always involves creative thinking- that is the generation of ideas or artefacts that are both new and of value (Boden 1990). While designers may work on projects that follow a familiar theme, there is normally a significant element of novelty which gives rise to a need to research new domains and, very often, to seek assistance from experts. Indeed, it is increasingly the case that a person working alone cannot solve all the problems associated with today's complex design projects (Ancona & Caldwell 1990) and often the most successful creative work is done by groups rather than by individuals working alone.

Candy and Edmonds have studied creative collaborations between artists and technologists working together in the development of digital artworks (Candy & Edmonds 2002; Edmonds et al., 2005). They have identified three styles of such collaboration (Mamykina, Candy & Edmonds 2002). Firstly the work may be driven by the artist with the technologist acting as the willing assistant. Alternatively, the full partnership model may be adopted, with the two roles being largely equal. The third relationship involves partnership but with the artist retaining control. Of course, such relationships often change over time as the task demands. Edmonds et al (2003) describe a particular instance thus: "The artist was content to leave much of the innovation and development of the system to the technologist, whilst retaining overall control of the artistic process. Whenever the work appeared to move away from his chosen objectives, he firmly took control and redirected the effort." Additional important factors in the success of such relationships, as Mamykina et al describe, are the development of a shared language and the opportunity for free and open communication, for example. John-Steiner (2000) also points to different styles of collaborative relationship having an effect on the work outcome, presenting four categories of collaboration, with the family relationship being the closest of these and also having the most dramatic creative outcomes.

It is often necessary, then, in this sort of work to find someone to work with and as the preceding paragraph has indicated, it is not just the practical skill of the collaborator that is important. In addition, they must be willing to form partnerships of various sorts, able to communicate freely and many other things besides. There is a requirement for considerable commitment to such projects and enthusiasm, as well as a sympathy towards the ends of the project, is also important. Our concern in the work described here is in how we can use computer tools to help us identify and locate potential collaborators, 'sizing them up' in a way in terms of their knowledge as well as their disposition towards becoming involved. This spans both

the training and experience of the potential collaborator and their present situation: are they likely to be too busy to help for example?

## The Medium

Our concern is with tools to support this sizing up process in order to maximise the potential for finding people. We are interested in using the Internet for this task as a global access medium and this offers particular challenges as well as opportunities.

Very often we only discover interests that we share with others by accident. When we introduce ourselves formally, we typically only describe a limited set of our interests, for example only those related to our current work if the introduction is in a work context. There are many other things that we could say about ourselves and our interests, but we choose not to do so because these things do not seem to be relevant. This information or knowledge that we might tell the other people is not always truly tacit in the Polanyian (Polanyi 1966) sense because, although it remains unspoken, often we *could* articulate the information but just choose, or just happen, not to. The tacit knowledge that Polanyi described, on the other hand, *could not possibly* be articulated and is often associated with 'know-how' or with physical skills such as riding a bicycle or, as one particularly apt example has it, recognizing the smell of cinnamon (Stenmark 1999). In this paper we shall describe the knowledge that could be articulated, if it only occurred to us to do so at the right time, as 'implicit knowledge' and next we will consider how such knowledge comes to be shared at all and how Internet technologies can be applied.

Schutz (1967) makes a distinction between what he calls a communicative act, which is an instance of one person deliberately sending a message to another, by speaking for example, and a communicative movement, which is some act or action that, while it is informative to the observer, was not made with the deliberate intention to communicate. Similarly, Goffman (1959) talks of expressions that people 'give' deliberately and those that they 'give off' without conscious intent. Knowledge is made explicit, and deliberately shared between people, by means of communicative acts. When we meet face to face, we write, speak and gesture to one another in order to explicitly transfer messages and using common Internet-based technologies such as email, Internet telephony and videoconferencing we can do all these things too. Where such mediated technologies tend to become less useful is in the exchange of communicative movements and we link these closely to the exchange of implicit knowledge.

Dourish and Belotti (1992) has pointed out that, in an open plan office, the ability to quickly scan another's computer screen to see what they are doing is important in team working. Similarly, Rosenberg (2000) suggests that, in a team setting, the ability to 'overhear' one another without necessarily having to be in direct communication allows people to jump in and take part in a conversation at the appropriate time. In both cases, it is the ability to catch another's communicative movement; to see the state of their computer display or to overhear a snippet of conversation that allows the sharing of new, unexpected, information. In this case, the computer screen might indicate that the person was busy, or that they were engaged in a particular task that might or might not be of interest to the observer. Similarly, by overhearing, one might discover that a colleague was trying to find out about a subject that one knew something about.

By presenting ourselves to others, in one way or another, we provide them with the opportunity to find aspects of interest to them; we allow them to 'pull' information rather than forcing them to rely upon us happening to 'push' the right information to them at the right time. Information that we email to another person, for example, is nearly all 'push'; there is little opportunity for the receiver to uncover something unexpected because writing an email is a communicative act and, beyond the words or phrasing that we choose to use, email does not support the transmission of communicative movements. At the other extreme, one might say that often a designer's sketch contains, for the uninformed observer, more communicative movements than communicative acts. Looking at Figure 1, which is an example of a typical designer's sketch, although it may not be obvious what the designer was working on, we can nevertheless tell quite a lot about what they were thinking and doing. It would seem, for example, that the work was done at some speed; perhaps the person was excited or enthusiastic about what they were doing. Also, the sketch seems to be largely unplanned at the start: it is not neatly laid out and there are some crossings out and areas where the designer seems to have changed their mind or where something unexpected has

emerged in the drawing. The drawing, then, contains additional information to that which was put there deliberately and this information is available to the observer. As has been pointed out above, the designer may also act as the observer of their own sketch, discovering new information there. In the same way that a person's body language or the pile of papers on their desk might indicate busyness, the sketch gives us a clue as to the designer's state of mind and what they were doing. An important difference, of course, is that the sketch is historic information, it is a record of what the person was doing, captured and available for later study. This knowledge is largely implicit, in our sense, in that the designer could possibly have included a written commentary with their sketch but in this case they did not do so.
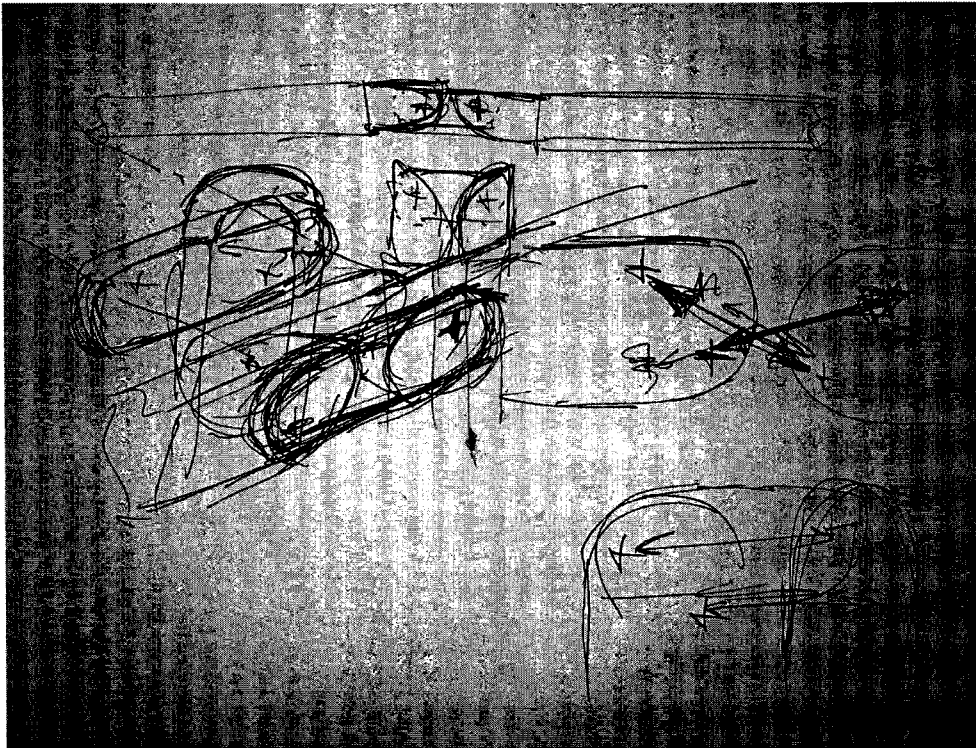


Figure 1: A designer's sketch

In the exchange of implicit knowledge, it seems that informal chatty or gossipy communication is useful. Direct, deliberate or formal communication, of course, is suitable for the exchange of information that we have chosen to make explicit. As has been pointed out, we learn about one another when there is opportunity for informal, casual interaction: (Kraut, Egido & Galegher 1990) "[m]ost often, naturally occurring, informal contact and communication provide the opportunity for potential collaborators to learn about each other, and also serve as the framework within which collaborative tasks are accomplished." When we meet together using, for example, videoconferencing systems typically the atmosphere is more formal, time is often limited and the opportunity for such casual interaction is reduced. As Egido et al (1990) note, the reduced opportunity for casual chat outside the formal meeting place made videoconferencing unpopular with those they studied.

This work, then, is about the study of informal, unintentional interaction and how we can facilitate this using the Internet.

## METHODOLOGY

Personal construct psychology (Butt & Burr 2004; Kelly 1955) is concerned with the ways in which people understand the world around them. This is not a simple matter of perception of stumuli, although of course

that is very relevant. Personal construct psychology, instead, deals with the meanings that we ascribe to artifacts and events or the inferences we draw from them. Understanding a person's constructs relating to a particular subject can give insights into the ways in which they behave. This approach to psychology, developed by Kelly in 1955 is in contrast to the behaviourist approach of others who view the person as being 'driven' to behave in particular ways in response to particular stimuli. That approach leads to the view of the person as a sort of machine-like entity. Taking this view, one might expect, with sufficiently close examination, to find some physical or otherwise innate basis for a person's character. Kelly, on the other hand, adopts more of a constructivist approach- something much closer to the 'nurture' end of the nature versus nurture debate (Burr 1995).

Kelly describes the principle of constructive alternativism which suggests that there are any number of ways of construing the world and interpreting what we see. The way that an individual interprets or construes some thing or some situation will depend on the culture in which they live and their past experiences as well as their current situation and this raises some issues with regard to the measurement of impression formation. The issue raised is that this implies it is not possible to assess whether someone has formed the 'correct' impression because who is to say what is correct?

As Walther (1993) points out, impression formation has historically been measured by means of recognition or attribution. That is, the interviewee is asked to match in some way a person with the impression they have formed previously in response to some information. This is a measure of the 'accuracy' of the impression but it is done by measurement of the compatibility between one impression and another impression prompted by some different stimulus. Walther himself instead studied how impressions strengthened over time and compared face-to-face subjects with subjects working remotely. In his study, the accuracy of the impression was less important and he concentrated instead on the change in impression. In the work described here, we are interested in understanding what prompts the formation of impressions and less interested in the actual impressions formed. For this reason, this series of interviews did not set out to uncover the one 'truth' about the person of whom the impression was formed. It was not the aim of the investigation to find out which interviewee formed the 'best' or most accurate impression, because there could be no truly objective way of deciding which impression was 'best'. In fact, one might argue that the word 'best' has no place here. Trying to say that one or other of them was 'better' in some sense would be imposing the interviewer's set of constructs on the data. Instead, the rationale behind this set of interviews was really to try to get some picture of the types of impression that were formed and how they came about. The aim was to form an understanding of which classes of elements in the photographic image, if any, could be related to which sorts of impression about the person.

## METHOD

The repertory grid technique which is well described in (Jankowicz 2004) is often used in assessing how people construe the world around them. Most broadly it is a way for an interviewer to carry out a structured interview without imposing their own views on the subject. Essentially, it aims to elicit from a subject a number of constructs about a set of elements. The constructs are typically expressed as polar scales. If the elements were, for example, places to go on holiday some typical constructs might be: has good weather - weather not very good, near the beach – inland, mountainous – flat, cheap to eat out - expensive to eat out, lots of interesting things to do  - not very many things to do.

The subject is usually asked to rank the elements (which would be the holiday destinations in this example) on each scale. Typically 5 or 7 point scales are used, and a 1 indicates that the element belongs (in the subject's mind) at the left hand end of the scale whereas a 5 (or 7) indicates that it falls at the right hand end.

Butt and Burr (2004) point out that "the meaning of any construct is defined in terms of its relationship with others" and it is the analysis of relationships between constructs and between elements that is a key part of the technique. In the example above, if the destinations that were ranked as 'near the beach' were also ranked towards the 'interesting' end of the 'lots of interesting things to do' scale, then one might start to make inferences about what the person's interests were.

In order to make analysis easy, the subject's ratings of the elements are usually presented in the form of a grid. Here, the elements are given one column each and the constructs one row each and they are typically arranged, after analysis, so that similarly ranked elements lie close together as do similar constructs. This is done using a process known as cluster analysis (Jankowicz 2004). Here, for every possible pair of constructs (1 and 2, 1 and 3, 1 and 4 etc.), the absolute difference in rating value for each element is calculated, these are added together to generate a sum of the differences for this construct pair. This sum of the differences is divided by the maximum possible difference imagining that for the first construct each element had been given a 1 and for the second each had been given a 5, therefore giving a maximum possible difference of 4 x (number of elements). By multiplying by 100 we can arrive at a percentage difference, subtracting from 100 gives a percentage similarity, which is the number commonly used. In the same way, percentage similarities for element pairs can be calculated and they can be grouped too. This allows us to identify which elements are alike, in terms of how they contribute to each construct, as well which constructs are alike.

One way of arriving at a list of constructs is known as triadic elicitation. In this method, a set of elements are either chosen by the subject or provided by the interviewer. In order to arrive at a construct, three elements are chosen at random and presented to the subject. The subject is then asked to think of a way in which two of the elements are alike but different from the third. For example, Sydney and Nice are near the beach but London is inland. All the other elements would then be rated on this scale with 1 representing 'near the beach' and 5 representing 'inland'. As successive triads are presented to the subject, it may emerge that the elements are ranked alike for different constructs and in these cases it may be necessary to explore the matter in more detail in order to draw out the way that the subject is thinking. Were many of the elements ranked alike for 'near the beach - inland' and 'lots of interesting things to do - not very many things to do', for example, it might be useful to ask the subject to try to think of another destination that was near the beach but that had not very many interesting things to do. Their answer to this question might then shed light on what it is about other beach locations that they find interesting.

**Practical Work**

The first stage of the investigation was the preparation of the source material. This consisted of a large-scale photograph of a person's desk at their workplace. In this case several images were taken and joined together to make a single high-resolution file that could be printed out at a size of approximately 1.2m x 0.8m. This image was shown in turn to some fifteen interview subjects. The interviews consisted of two phases: in the first phase the elements were identified and in the second phase the triadic elicitation process was used to elicit the interviewee's constructs about those elements.

At the start of the interview the subjects were told what its purpose was to be and the process was also described to them. In the first stage, the subject was presented with the large-scale image of the person's workplace. It was made clear to each subject that the interviewer was neither the owner of the workplace nor were they personally acquainted with the owner beyond having met them for the purpose of taking the photograph. The subjects were informed that the interview was aimed at finding out what information about the person could be gleaned from study of their workplace via the photograph.

The first phase of the interview involved asking the subject to pick out from the photograph any interesting objects, groups of objects or overall impressions that struck them as telling them something about the owner of the workplace. Typically eight or nine elements were chosen. As the subject chose each element in the picture, this was marked with adhesive tape so that it could be readily identified later in the discussion. During the subsequent interview, the subject was occasionally asked to look again at the objects they had chosen. This was to ensure that they were thinking of those specific objects in the photograph and not just of general classes of objects.

The interviews were conducted using the Rep IV (Gaines & Shaw 2005) computer program which is designed for repertory grid interviewing. Using this software, it was possible to enter the list of elements as the subject identified them. The triadic elicitation phase of the interviews were also done using the software to select sets of three elements at random from the list. The subject was then asked to think of a way, in terms of what the elements told them about the owner of the workplace, in which two of the elements were

alike and different from the third. A typical answer might be that 'the biscuits tell me something about what the person is doing just at the moment but the spray adhesive and the recorded CDs tell me about what they usually do'.

## DISCUSSION OF RESULTS

Here we will present an overview of our findings.

Over the course of the fifteen interviews, it became clear that there were a few elements in the image that were consistently chosen by the subjects. A large area of the image was taken up by a bookshelf and the books as a group, as well as one or two subject-specific sections were often selected. A few interviewees selected individual books from the collection, and these people generally had prior knowledge of those particular books. In addition there were also a number of collections of objects, a collection of ornamental 'snow domes' for example and some postcards on the wall that were often picked.

In accordance with Kelly's principle of constructive alternativism, different interviewees did indeed construe what they saw in different ways, although there was some consistency in the constructs themselves. The arrangements of objects on the desk, and the ordering of books on the shelf, consistently gave rise to comments about whether or not the person was organised or tidy in their habits. Some subjects, though, thought that the arrangement was untidy, highlighting the 'messiness' or 'clutter' while others picked out the 'neatish impression' or the 'fairly organised bookshelf'.

The collection of snow domes was often associated with impressions about where the person had travelled to as were a number of other ornaments in the picture and the postcards. The book collection, which was described by one interviewee as 'focused' generally gave rise to impressions about what the person did for a living as did a number of items such as spray adhesive and a collection of CDs. The book collection, which was often described as extensive or large, also gave rise to impressions about the person's age; 'it takes a long time to collect so many books' being a typical comment. Other elements that were often related to the age of the person were a set of dolls from a popular television programme.

The constructs from all the interviews were grouped into categories by a process known as bootstrapping (Jankowicz 2004). Here, all of the constructs from all of the interviews were taken one by one. In each case where a suitable category had already been created for the construct, it was assigned to that category. If there was nothing appropriate, a new category was created and at that time previously-created categories and previously-assigned constructs were reviewed to see if reassignment would now be appropriate. Using this system, eight categories of constructs were created as follows:

- to do with sense of humour,

- to do with personal interests,

- to do with personality,

- to do with the person's personal habits,

- to do with the person's current situation (what they are doing today),

- to do with the person's past, high points or memorable events,

- to do with what the person does for a living,

- to do with the person's personal situation, their sex, age and so on

Reviewing the assignment of constructs to categories, it was possible to see which interview subjects had come up with constructs that fell into each category. This information is represented below in Figure 2. Here, the interviewees have been given one column each and the different sections in the column represent the number of constructs that they came up with in each category. In this representation, the interviewee columns have been ordered so as to bring similar ones together. We can see, for example, that subject 'm' concentrated mainly on the personal interests of the desk owner: seven of the constructs that they arrived at were to do with personal interests and only one related to the person's professional life. Subject 'o' on the

other hand, shows a much greater spread in the range of constructs that they arrived at. We can see that interviewees 'n' 'o' and 'l' have responded in a similar way, having a similar mix of types of constructs. It is important to note that we are not looking here at the exact nature of the constructs, merely the subject area that they relate to. Subjects 'o' and 'l' may have had very different views about what the person was like, but they were both concerned with the same mix of subject areas.
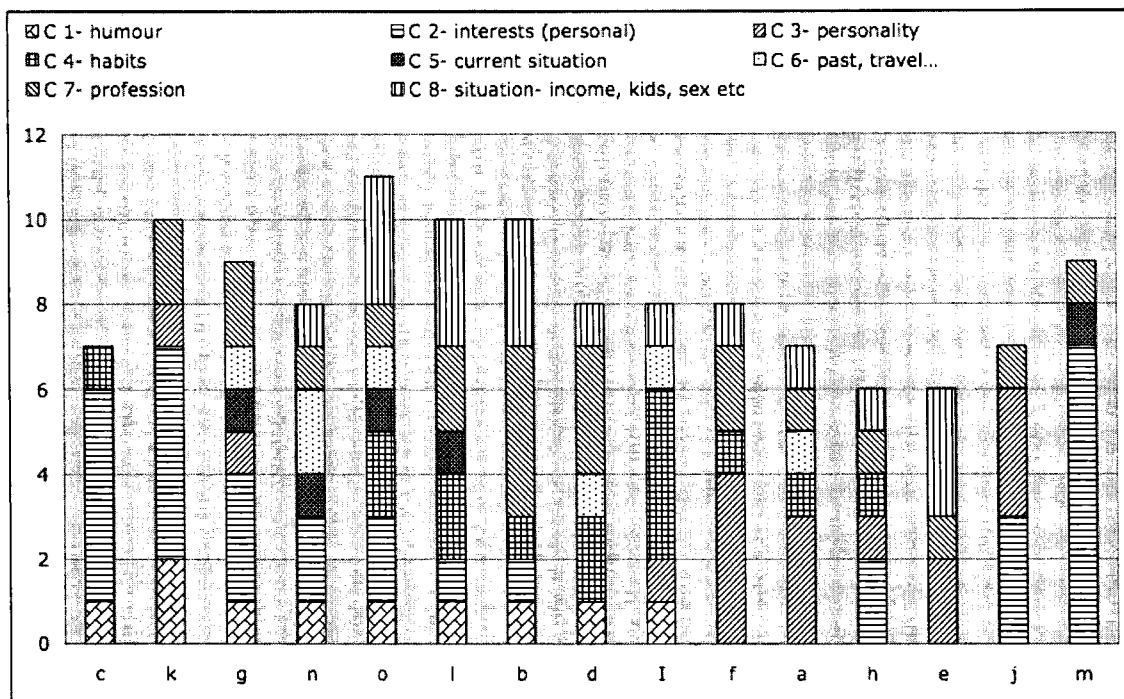


Figure 2: Subjects' construct groupings

What is striking about this analysis is that there is variation in the impression that the interviewees formed, and the constructs that the photograph data brought to mind, even though the data in the photograph was the same in each case. This seems to indicate that this series of interviews, rather than just revealing new information about the person whose desk was photographed, has told us more about the interviewees. This was an unexpected result. We have already an indication as to the types of impressions that they have formed, and the sorts of areas that they concentrated on. Further analysis of the data will be required to uncover more information about which classes of elements were most commonly associated with which category of impression although we can already see that some elements are more important than others in certain categories.

Barthes (1980) suggests that a photographic image can have for the observer what he calls a 'punctum' which he describes as "that accident which pricks me (but also bruises me, is poignant to me)". Not all photographic images have such a punctum, and it is not necessarily the same for everyone, but where there is one, something jumps out at the viewer. The viewer can quickly scan an image, skipping over the parts that are not of interest and stopping to study only those aspects that grip them in some way. In this investigation we have seen that people did indeed pick out different elements, some concentrating in detail on the book collection for example, and others just seeing it as a whole. Overall, this investigation has given us some insight into which elements in the image were important to each subject and what impressions they prompted. The repertory grid technique was found to be effective as a way of structuring the interviews. In addition, we have seen that presenting photograph data about a person's workplace can give rise to strong impressions not just about what they do for a living but also about their personal interests, sense of humour and many other aspects besides: information that they might not think to deliberately share when introducing themselves using mediated communications technology.

## CONCLUSION

In this paper, we have described how impression formation is an important part of creative design work, specifically in the formation of the close working relationships that are often required. We have discussed repertory grid and described how we applied this technique to our analysis of impression formation. In addition we have presented an overview of the results of the interviews that were carried out. We can already spot patterns in the data and in further work we will be applying our new knowledge in the further development of our prototype system (described in (Weakley & Edmonds 2004)) for sharing implicit knowledge between remotely-located people. One unexpected outcome was that the interviews, rather than just telling us about the person whose desk was photographed, in addition revealed information about the interviewees themselves.

We found the interview technique that we used to be effective in getting an insight into the sorts of impressions that people form from photograph data and we have seen that such data can be useful in sharing implicit knowledge.

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