

An example of this offered by Eckert and Stacey is 'a jumper like the blue one last year, but a bit longer and with a V-neck'. This research also linked the work to a previous study of helicopter designers working for GKN Westland, which suggests that this finding may be fairly generic. Thus a design currently being considered in a process was described as a recombination and modification of elements taken from previously known designs. What this research showed was that enormously complex sets of ideas can be communicated in this simple way. Of course this also showed the extent to which a group of designers needed to share a common understanding and knowledge base in order to collaborate. In the previous example then as the authors point out 'blue' or a 'bit longer' has a different meaning in 1999 than for 1996. This leads to a whole language of design based on an understanding of design concepts and precedent that is extremely powerful and economical but only works if the schemata used are shared. 'Often the referents of the designers' descriptions are nowhere to be seen, but are simply part of the designers' shared cultural experience' (Eckert and Stacey 2000).

## Negotiating between the problem and solution view

Maher and Poon (1996) talk of how designers 'play around with ideas to get more understanding about the problem rather than focus on just finding a solution'. They go on to develop what they call a 'co-evolution' model of designing using the paradigm of genetic evolution algorithms. In this model they see a series of solution states each evolving from the previous one in parallel to a series of problem states again each evolving from the previous one. However in the Maher and Poon diagram there are cross-influences in both directions so potentially each evolutionary development is the product of the previous state in both the problem and solution series. They suggest that this highly ingenious notion could be implanted in software to produce design-like thought, although the examples they give do seem to belong to the world of fairly well-defined and highly constrained problems.

In a delightful study Dorst and Cross (2001) showed real evidence of the validity of the Maher and Poon co-evolution model in some design protocols. However even more interestingly they suggest that adherence to this way of thinking may be characteristic of design processes which we consider to be creative. They set nine

industrial designers the task of designing a new litter disposal system for new trains on the Dutch railway network. Remarkably all nine designers followed a similar reasoning path which hinged around connecting various separate pieces of information about newspapers. In different parts of the brief these were identified as a significant proportion of the refuse generated on trains, often left behind on luggage racks, and as being a nuisance to the train cleaners. Again elsewhere in the brief, the client expressed a wish to develop a more environmentally friendly image. Each one of Dorst and Cross's designers finally arrived at a solution which involved collecting and keeping newspapers separately from other refuse and designing special containers for them. Thus they effectively took on a new problem; that of designing a container specifically for the cleaners to collect newspapers in. Amusingly Dorst and Cross observe that the designers also all thought they were being original and creative in doing this! As Dorst and Cross point out, this behaviour aligns beautifully with the Maher and Poon co-evolution model. It was possible to see in the protocols a process in which pieces of information in the problem were collected together to form a single idea that led to an evolution in the solution state and a redefinition of the problem.

## Framing

So we have discussed the idea of conversation as negotiation. We have seen forms of this negotiation to resolve conflicts and forms of negotiation between the problem and solution view of the design situation. What is common here is the idea that somehow, through a clever mental process, some obstacle or conflict is simply removed by taking a particular view. In all such negotiation the skill lies in finding this view. In the design process the equivalent of this can be seen in an activity that Schön has called 'framing' (Schön 1984). In a way this framing process is similar to the idea of the primary generator which we introduced in Chapter 3 and discussed in Chapter 11. In the sense that it has been used in those discussions a primary generator is most normally a solution-driven idea. Quite simply a suggested form of solution is proposed and the implications of this are then explored. Schön's idea of framing is a rather looser notion and is often seen as more problem driven. In truth it is not entirely clear exactly what Schön meant by a 'frame'. The idea is none the less useful for its vagueness, and we