

# *The user as a scenic feature of the design space*

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*In contrast to the more usual approach, we focus on the internal configuration of the design process. Using the concepts of type and typification as applied to design reasoning, we present an account of reasoning about 'the user' in design. Our analysis shows users are spoken of in many different yet systematically related ways. This structure of usage is shared by designers and taken for granted in their work practices. It forms one of the resources designers use to construct their design worlds.*

*Keywords: users, system design, design worlds*

A great deal of interest has been shown recently in the character of design reasoning. In particular, attention has focused on the formal and semiformal properties of the design process with a view to developing computational tools which might support the practical management of design. Our approach to these issues attends to what we will characterize as the 'internal configuration' of design work. By contrast, it is much more common for studies of the design process to concern themselves with the 'external configuration' of that process. That is, they seek to achieve a formal and abstract representation of the structure of design and analyse the component activities making up the overall organization of the design task. Thus, their methodological strategy is to examine the design process with the eyes of an 'outside observer'.

The purpose of constructing an analytical, 'external' representation of the design process is to bring out the underlying structure in what might otherwise appear to be an entirely free-form process. Without this structure, as Rouse and Boff<sup>1</sup> have observed,

if an outside observer were to characterise designers' behaviors, particularly for complex domains such as aircraft design, it is quite likely that such an observer would conclude that chaos is the most appropriate characterization of design teams at work . . . Of course, the apparent chaos is, for the most part, due to the inability of the outside observer to know exactly what is happening.

As we say, we want to consider design more in terms of its 'internal configuration', that is, the way in which the organization of the design process appears to those involved in it. As Rouse and Boff have indicated, those doing the designing see a much greater sense of coherence in the flow of their activities than the standpoint of an 'external analyst' often captures or reveals. It is not our purpose to compete with such 'external' analyses of the design process but to complement them. Through our shift of focus, we hope to highlight the activities by which the inherent organization of the design process is 'built up', and which would not normally come to the attention of those looking at the process from a more 'external' point of view.

The approach we adopt draws upon Herbert Simon's suggestion that design problems be treated as 'ill-structured problems'. Simon<sup>2</sup> uses the example of designing a house to illustrate his idea:

There is initially no definite criterion to test a proposed solution, much less a mechanized process to apply the criterion. The problem space is not defined in any meaningful way, for a definition would have to encompass all kinds of structures the architect might at some point consider all considerable materials, all design processes and organizations of design process. The hopelessness of even trying to sketch the congeries of elements that might have to be included in the specification of a problem space proves the greater hopelessness of defining in reasonable compass a problem space that could not, at any time during the problem solving process, find its boundaries breached by the intrusion of new alternatives.

And yet, despite the ill-structured character of the problems which designers face, they still manage to find solutions. Using results from a study of actual design protocols, Guindon<sup>3</sup> has suggested a number of strategies which enable designers to find a firm enough structure around which to develop their solutions. Among these are the development of scenarios, the envisaging and elaboration of the requirements of the design, and the exploration of inferred constraints upon the solution.

## 1 Design worlds

One of the recognized limitations of much work on the design process is that its analyses are confined either to artificial or exemplar problems or to nonpractising designers, usually students; and sometimes both. The

**1 Rouse, W and Boff K** 'Designers, tools and environments: state of knowledge, unresolved issues and potential directions' in **W Rouse and K Boff** (Eds), *System Design* North Holland, New York (1987)

**2 Simon, H** 'The structure of ill-structured problems' in **N Cross** (Ed) *Developments in Design Methodology* Wiley, Chichester (1984) pp 145–164

**3 Guindon, R** 'Designing the design process: exploiting opportunistic thoughts' *Human Computer Interaction* Vol 5 Nos 2–3 (1990) 305–344

discussion of the use of 'design capture' methodologies by Conklin and Yakemovic<sup>4</sup> is a significant exception to this. However, it is interesting that the general strategies which we mentioned above are also noticed, although reported in somewhat different terms in studies of commercial design work. Bucciarelli<sup>5</sup> for example, noticed a number of ways in which designers formulated what he terms 'the object worlds' of design. It is in part the existence of these different object worlds *for* design which generates its ill-structured nature.

The attributes of the object and their interrelations constitute the object, but different constellations or sub-sets of attributes (constellations is a good word, for the attributes within a sub-set are in fixed relation) are of interest to different persons in design. These constellations are situated within theories, or models of behaviour of the object. So differently schooled participants will see the object of design differently according to their special interests. Each will work out the design task according to their design task, *relying on different kinds of models, theories, tools, constraints. Each will work within a different 'object world': a world of technical specialization, with its own dialect, system of symbols, metaphors and models, instruments and craft sensitivities*<sup>5</sup>.

There are two important themes in this approach to which we will return. The first is that the 'object-world' is constructed for the design by the designer. Viewed from within any moderately complex design project, the 'overall unity' of its contributory activities has to be 'forged' out of a set of heterogeneous orientations. The formation of differentiated 'object worlds' is a precondition for the generation of tractable problems that can be subject to specialist skills. However, those 'object worlds' have to be interrelated within and through the working division of labour. In this respect, Cuff<sup>6</sup> has concluded from her study of architects, that the work of design displays many of the characteristics of what sociologists recognize as a 'negotiated order' (Strauss *et al.*<sup>7</sup>), the structure of the process being 'locally organized' to a substantial degree. The abstractly conceived objectives, methods, requirements, schedules, roles, and responsibilities of a project have to be implemented in circumstances which simply cannot be foreseen and detailed in the setting up of the project. The parties to the design process must 'negotiate' amongst themselves how the (frequently evolving, even uncertain) prescriptions for their project can be realized in their respective courses of action. It is not, then, that the parties are involved in carrying out the demands of the design project but that they are frequently involved in 'working out' as the enterprise evolves, what the project demands and how, in the light of circumstances as they stand, this is to be delivered. In such negotiations many problems are not resolved but are managed through what is essentially a process of collaboration, bargaining and compromise.

**4** Conklin, J and Yakemovic, K C A process-oriented approach to design rationale *Human Computer Interaction*, Vol 6, Nos 3 and 4 (1991) 359–391

**5** Bucciarelli, L L 'An ethnographic perspective on engineering' *Design Studies* Vol 9 No 3 (1988) 159–68

**6** Cuff, D 'Negotiating architecture' in Osterberg, A, Tiernan, C and Finlay, R (Eds) *Optimizing Environments: research, practice, policy* Environmental Design Research Association (1981)

**7** Strauss, A, Schatzman, L, Erlich, D, Bucher, R and Sabshin, M *Psychiatric Ideologies and Institutions* Free Press, New York (1964)

The problem of aligning 'object worlds' is not confined to situations of collective design. It is also central to the problem of creativity in design<sup>8</sup>. Here it appears as the problem of applying prior knowledge to novel designs. Since each new 'object world' is unique, how do designers manage to draw upon and creatively apply their experience? In two seminal articles, Porter<sup>9</sup> and Schon<sup>10</sup> have grappled with this problem by reflecting upon their collaborative studies of design and of design reasoning. Relying heavily on Goodman's defence of ontological relativism in his critique of rationalist philosophy<sup>11</sup>, both acknowledge that the creation of what they call 'design worlds' serves as a way of subduing the demands created by the complexity, uncertainty and need to locate each design in its unique setting. Such demands provide the constraints which all of the studies we have mentioned point to. Where Schon and Porter differ from these other studies is in the analyses of the constitution of 'design worlds'. Rather than being pre-occupied with design ontologies, their focus is on its epistemology; that is, in the co-ordination and grounding of methods for generating and applying design knowledge in creative ways. The central device which they seize on here is that of design *typification*. According to Schon it is the organization of design knowledge into types and the rules of their application which underpins design creativity.

We believe that the *rules* employed in design reasoning are derived from types. As rules of law are derived from juridical precedents, so design rules are derived from types, and may be subjected to test and criticism by reference to them. Moreover, a designer's ability to apply a rule correctly depends on familiarity with an underlying type, by reference to which the designers judges whether the rule 'fits the case' and fills the inevitable gap between the relatively abstract rule and the concrete context of its application as a type. There is a two-way interaction between design types and design worlds. On the one hand, elements of a design world may be assembled to produce an artefact that comes to function – either in the practice of an individual designer or a larger design culture – as a type . . . On the one hand, the direction of causality may be reversed. A vernacular building type . . . may 'loosen up' to provide the furniture of the design world<sup>10</sup>.

**8 Oxman, R** 'Prior knowledge in design: a dynamic knowledge-based model of design and creativity' *Design Studies* Vol 11 No 1 (1990) 17–27

**9 Porter, W** 'Notes on the inner logic of designing: two thought experiments' *Design Studies* Vol 9 (1988) 169–80

**10 Schon, D** 'Designing: rules, types and worlds' *Design Studies* Vol 9 No 3 (1988) 181–90

**11 Goodman, N** *Ways of Worldmaking* Harvester, Brighton (1978)

What Schon is pointing to here is the fact that design is *irredeemably analytic*. In that sense its methods contrast with those made familiar by the experimental sciences. For reasons we will outline in a moment, design is not and cannot be data-driven. While 'the way the world is' enters design decision-making at many crucial points and many different guises, its inclusion is only rarely in the form of enumeration of particulars. While it might be possible to develop a design methodology which operated in this way, since information is not a free good, the constraints of cost and time are likely to make it very expensive and tardy (witness some of the debate

surrounding participatory design<sup>12,13</sup>. Further, at least in the early stages of design, when many critical decisions are made, designers are in no position to collect much relevant information anyway. Often all they have to work with are envisionments, paper designs, mock-ups and prototypes. Whilst these can and do yield useful information, that usefulness is directly proportional to the designers' ability to intuit potential scenarios and users; that is, the designers' ability to bring their experience and cultural knowledge to bear upon the problem. The use of typification is, therefore, intrinsic to design, part of its essential professional practice.

The recognition that the design process is a collective matter tends to draw attention to the fact that design activities are 'social processes' that involve participation in and co-ordination between social groups. It might be that a more telling thought is to characterise the design process as a 'socio-cultural' process. Schon's formulation, for example, acknowledges the extent to which the design work, design thinking, is conducted according to standardized and shared understandings. This implies, we suggest, that, as Schon has formulated it, the problem of design knowledge and design worlds is but one instance of a much broader *problematic*, for in such institutions as the law, medicine, even science, as well as mundane life, the same interdependencies are on view. Schutz<sup>14</sup> called this the problem of 'the socialization of the subjective stock of knowledge'. How does individual experience become generally available as cultural knowledge and how is that then individualized to be applicable in any specific, context dependent situation?

Gurwitsch summarizes the general approach which Schutz takes to this problematic in the following way.

We do not, each one of us, experience the life-world as a private world; on the contrary we take it for a public world, common to all of us, that is for an intersubjective world<sup>15</sup>

The way this world appears to us is in the form of known common structures of types. Once again, Gurwitsch offers an excellent summary:

Encountering an animal, I perceive it one time as a quadruped, another time as a dog, still another time as a dog of a special sort. In every case, the animal is perceived as typified; it appears with the sense of certain typicality. According to the type in question, certain aspects, features and aspects of the animal acquire emphasis and prominence, while others may pass unnoticed . . . To a stranger not familiar with our society and civilisation, the things and utensils we use, whose typical use and typical meaning are with us as a matter of course, will appear in a light highly different from that with which we perceive them. Conversely, if we come to a strange society or discover the material remainders of a civilisation of the

**12** Carter, K 'Interacting with users – a practitioner's experience' In S Woolgar and F Murray (Eds), *The Sociology of Software* (forthcoming)

**13** Greenbaum, J and Kyng, M *Design at Work* Lawrence Erlbaum, Hillsdale NJ (1991)

**14** Schutz, A and Luckmann, T *The Structures of the Lifeworld* Heinemann, London (1974)

**15** Gurwitsch, A 'The common-sense world as 'social reality' *Social Research* Vol 29 No 1 (1962) 50–72

past, we are more often than not at a loss to 'understand' those utensils, since we do not know, at least at the outset, their typical purposes or, consequently, their typical uses<sup>15</sup>.

It seems clear that, under Schon's analysis, the designer confronting each new design task seeks to define the design space in terms of structures of types and in so doing follows precisely the same strategy which, on Schutz' view, underpins cultural life in general. Schon's investigation is an instance of the strategy outlined in *The Reflective Practitioner*<sup>16</sup>. The individual designer is exhorted to be conscious of his or her own reasoning process. It is, of course, the case that the business of design is often also carried out as a collaborative matter, involving a team of individuals. In such cases, there is a need for an analytical balance between 'the individual' and 'the collective' aspects of design. We hope to complement Schon's attention to the typificatory practices of individual designers by focusing more on the team organization of design. The working out of the design is something which is extensively done between individuals within the design project and, as part of our interest in the ways designers work together, we shift the focus of attention slightly, putting it into ways in which designers reason with each other.

In the rest of this paper, using data drawn from our own studies of design, we want to illustrate the usefulness of this approach to the analysis of the unfolding of design decision-making. We will focus on some of the ways in which standardized modes of talk about 'the user' enabled designers to confront and manage the interdependence of designer's tacit knowledge and cultural experience and the particularities of a particular design problem as part of the actual course of design reasoning. In talking in this way, 'the user' came to be a scenic feature of the design space and its delimitation. In this sense, then, 'the user' figured in the collaborative reasoning of designers and played a role in the reciprocal persuasion through which the internal configuration of the design space was (in part) constructed *in media res*.

## 2 *The design projects and their setting*

The setting which we studied is a large development and manufacturing establishment in the UK. Over a period of six months we were associated with two design projects on a day-to-day basis. The first was a small fast-track project involving the provision of a fast feeder as an add-on to the functionality of an existing product. The aim was to try to capture what was seen as a potential market opportunity. The second project was much larger and involved a great many more people. Here a whole new machine was being developed. By the time we became associated with it,

**16** Schon, D *The Reflective Practitioner* Temple Smith, London (1984)

the design had reached the point where the team were preparing for field readiness trials. Most of the concerns of that part of the project which we were able to join had to do with the integration of software and hardware. The materials which we gathered on both projects consist essentially of records and tape recordings of meetings, copies of plans and documents, lengthy informal interviews with participants, and all the normal bric-a-brac which the ethnographic field researcher accumulates. The most important element of all, though, was our gradual acquisition of an intuitive understanding of how each design team was progressing, their likely responses to potential situations and events, and a general feel for the character of design as routine working life in that environment. It was only after we had acquired this that we could say we felt 'we knew our way around'. In what follows, we will rely extensively on this sense of knowing our way around this design setting and will appeal to the recognizable similarities between this setting and its design processes and others for the substantiation of our characterization of how some aspects of the designing appeared as routine features of the workaday world.

## *2.1 The user as a scenic feature of design*

We have said that users were not participants in the design activities which we observed. Although it would have been possible to consult them, and indeed procedures do exist for such consultations to take place, they were not deemed necessary or relevant for the work in hand. In part, again to repeat an earlier point, this has to do with the economics of information. Formulating the questions to be asked, extracting the information and processing it so that it would be useful at this stage of design are impracticable given the constraints within which the design teams were working. However, this does not mean that users were not present in the designing, simply that their presence took a particular form. Using Lynch's<sup>17</sup> term, we want to say that 'the user' was a 'scenic feature' of the design process in that what users would want, what they might do, what they would be willing to accept were treated as significant and sometimes even decisive. We use the term 'scenic feature' to capture the sense in which 'the user' was oriented to as part of reasoning in design. That is, what could be said about 'the user' was there for all the participants to see as what could reasonably be supposed to be the case given the point of view being espoused and the considerations currently relevant. To refer back to Schon's formulation, 'the user' is an element in a design world, constituted as 'what any reasonable designer would say' and in terms of 'what reasonable considerations should be in play'. Putting it another way, 'the user' is a designer's object, a construction which is effective only in so far as it conforms to what all reasonable participants to these design processes see might be the case. In an early discussion Oliver and

**17 Lynch, M** 'Preliminary notes on judges' work, Centre for Criminology, University of Toronto (1979) (unpublished paper)

Langford<sup>18</sup> summarized some of these constructions. Following Schutz<sup>14</sup>, we want to say that the common availability of such reasonable constructions is one of the premises of design. It enables the collaboration and compromise on which design's negotiated order depends.

## 2.2 *The user as a social type*

Sometimes when the designers were trying to work out some particular detail, reference would be made to just who the potential users might be. Thus, for instance, it might be suggested that the user might be a secretary, or a manager, or a key operator. Having designated these kinds of users, it was possible to introduce sets of expectations about what they might be trying to do, what they might know about the machine or process in question and how likely they were to initiate one or other sets of routines. In the terminology developed by Schutz<sup>14</sup>, 'secretary', 'manager', 'key operator' are *personal types* associated with which are constellations of roles and relationships. In addition to these personal types, our designers also deployed what Schutz calls *course of action types*. Here the defining characteristic is not social identity, gender, organizational position or role, but an envisageable course of action which is being undertaken. It was around what could reasonably be said about such courses of action that 'the user' entered the design decision making.

One very clear example of the above took place in a discussion of copy counting routines, output stacking and errors. Here 'the user' was talked of as 'someone who is running a long print job on a network printer but who, for one reason or other, wants to remove copies from the output stack before the job is completed.' The designers were not interested in who this person might be nor why they would want to do such a thing. Nonetheless they were confident that *someone* would, and that they would simply remove documents from the printed stack without awareness of the consequences this would have for machine operations. Given certain set-ups, such actions could well 'disorient' the printer which had been designed to keep adjusting the position of the output platform in relation to the changing height of the printed stack. This would cause it to deposit copies on the floor. Once this possibility had been introduced, its adequacy as a depiction of what could happen was not resolved by 'turning to the data' (surveying users to see if they did do this, reading error logs and the like) but by reference to what those around the table felt. Was there agreement that this could and did happen? Was it the kind of thing one could imagine happening? That point is that while there was not always consensus, the process of arriving at a resolution was discursive not empirical. Things were talked through and reasoned conclusions arrived at.

**18** Oliver, I and Langford, H  
*Myths and Demons and Users*  
Proceedings of the Australian  
Computer Conference, Australian  
Computer Society Inc (1984)



We talk of the user being a scenic feature rather than as a topic for design because as our example shows, designers did not focus on users and their actions *for their own sake*. Rather, the issue of what users would or would not do arose in the context of some other topic. So, the discussion of removing copies from the output stack arose during design of the output platform. If the printer is designed to be able to handle very long runs, it will be necessary to ensure the platform height is self-adjusting, otherwise as the stack of completed copies builds up, further ones are likely to be thrown onto the floor. But, if the platform is self-adjusting, does it need to know when finished copies have been removed? And if so, how will that information be made available? A similar discussion arose when the use of a VDU for possible user-interface displays was under discussion. Given the potential complexity of this information, how should it be arranged? This led to the discussion of what 'the user' might expect of the machine, what they would want normally to do with it, the extent to which it would be seen as 'just another photocopier', how much of the functionality would be recognized and so on. These interpretations formed the basis for decisions about layout, levels of information, help routines and so on.

In terms of the analysis by Schutz<sup>14</sup>, the utilization of social types enables intersubjective understanding. We presume that our knowledge of the world meshes with yours: our interpretations are congruent with yours because we all talk of the furniture of the world and the processes which go on in it in the same ways. These common concepts are the structure of the world. In design, they structure design worlds. Clearly, as we discussed earlier, such worlds are typificatory. In what follows we will sketch some of the ways in which 'the user' as a course of action type contributes to the *structuring* of design worlds. We place emphasis on the active character of this use of course of action types because it seems to us that much of what is being done through the use of these types amounts to a search for methods of indirect or remote communication of design intentions. In envisaging what the user might do, designers are seeking how to provide the user with some understanding of why things have been designed the way they have, what the user might want to know about the machine's functionality, what the designer thinks is necessary for the user to do so that the design functions effectively, and so on. In some sense, they are seeking to construct a design world for the artefact within which users can find their own way around.

#### *The user is a misuser*

Users are presumed not necessarily to recognize the consequences of their actions for the machine. In particular, they are presumed not to be interested in or care about the engineering design features of the artefact.

In fact, the character of many features is minimally understood and hence the consequences of actions little appreciated. Thus, for instance, if a machine has an extension at table-height, for instance a high capacity feeder, it will be leaned on; coffee cups will be left on it; it will be used as a convenient point of leverage by which to move the machine around. Leaning on the extension, using it for leverage etc., might well distort the frame of the host machine. Coffee cups will leave sticky rings which will impair paper feed and give spoiled copies. None of these amounts to sabotage of the machine, simply the likely misuses which, as an object in a working environment, the machine is prone to.

#### *Users are bundles of natural reactions*

When we talk of natural reactions here we mean nothing more than the fact that users will define some piece of technology in terms of those with which they are already familiar or will react to some response from the machine in ways natural or automatic. This often has the consequence of rendering functionality invisible because it is not usually associated with equipment of this kind. Such functionality has to be made explicit to the user. Thus, designers found that the functionality provided by a machine was so extensive as to require the provision of a 'tutorial' function to draw the range of functions to the attention of readers but then faced the problem of finding ways of getting users to notice that the 'tutorial' was available and to explore it. Similarly, if the machine seems to be unresponsive to some user action, users will often simply repeat the action, for example pressing the start button unless they are expressly prevented from doing so. Designers will often seek to constrain or take advantage of these natural reactions to ensure certain features are noticed or specific processes and routines complied with.

#### *The user is a pragmatic orientation*

Users approach some piece of technology with a specific task in mind. Their interest is in completing the task not in exploring the technology as a set of 'problematic possibilities'. This orientation defines the common-sense attitude in the mundane lifeworld. Crucially, it differs from that of science and the other analytic disciplines (such as design)<sup>14,19</sup>. The features which they orient to are defined in terms of the relevances of the task. Features which are not germane to this task are often not so much ignored as simply, in Garfinkel's phrase<sup>20</sup> 'seen but unnoticed'. Should designers wish users to take advantage of them, then they have to be made salient to the users' envisaged pragmatic orientation. Thus, for instance, if a user wishes to produce double-sided copies from single-sided sheets, such documents will often then be collated and bound. For effective presentation, the inner margins of the pages may be offset to leave enough

**19** Husserl, E *The Crisis of European Sciences and Transcendental Phenomenology* Northwestern University Press, Evanston (1970)

**20** Garfinkel, H *Studies in Ethnomethodology* Prentice Hall, New Jersey (1967)

space for the binding. Should such a facility be available on the machine, designers will have to ensure that the user has the opportunity to choose to offset the inner margins while programming the print job. Since the user may not know that this facility is available, the decision to offset or not may have to be explicitly requested. Many users' natural reaction is simply to select 'double-sided copies' and press *Start*.

### *The user is an effort calculus*

Given their pragmatic orientation and natural reactions, many users regard the operations imposed on them as nuisances or troubles. Some will be routine troubles normally associated with using the machine. Others will not. Having to select different paper orientations or sizes, remove one type of paper and refill the input hopper, hand feed odd sized sheets, remove old originals from the output hopper because the previous user has forgotten them, may all be normal troubles. Looking up procedures in the manual, finding and using the online help system may not. The degree to which for many users such tasks and troubles unbalance the effort bargain of using this machine will depend on the relative gains to be made. Designers, in trying to minimize the troubles to which users are put while at the same time trading off this effort against the range of functionality made available, orient to the likely levels of effort which different kinds of users will be willing to expend. Can some trouble be seen as normal for one type of user and non-normal for another? Using Garfinkel's discussion<sup>20</sup> of the place of 'normal, natural troubles' in routine activities, we can ask how can it be 'normalized' for all users?<sup>14</sup>

Clearing paper jams is one such routine trouble. No matter how well designed the machine may be, at some time the free flow of paper through the paper path will jam. In providing ways for users to unjam the paper path, designers envisage not only who the user is, invoking the personal types mentioned earlier, but also what job may be in hand. Constructing the machine so that it appears to be difficult to gain access to points where jams routinely occur may mean that many users will simply walk away and try some other copier. Only key operators, technicians and those engaged in jobs which are specific to this machine may be willing to go to the effort of unjamming the machine. Envisaging the effort bargains of many different kinds of users will lead designers to make decisions about what is or is not practicable both within the context of the design and that of its potential use.

## *2.3 The user as a source of legitimation*

We have spoken of 'the user' appearing in design discussions as a social

type. This is not the only way in which use and usage scenarios are introduced. Equally important within the overall context of the design process is the invocation of the user as a source of legitimation for particular design decisions. From our materials, we have noted three leading ways in which this can occur.

#### *The user as a rhetorical device*

Throughout the design projects which we studied, there was a constant flow of information concerning the results of operability tests, summaries of customer satisfaction surveys, and digests of field trials. This information was often circulated in documentary form or introduced by individuals in the course of meeting discussions. Where such information was made available, it was always construed in the light of the design discussions which were currently in hand. That is, what the users had to say, what they did or did not do, how well the prototypes were working, did not appear simply as data but as part of someone's argument for or against a position being developed. It was evaluated in terms of how it contributed to the strength or weakness of some case being considered. In that sense, to pick up a theme we touched on earlier, the user became involved as an essential part of negotiating the design. Indeed, being able to couch one's proposals in terms of user considerations is a powerful way of ensuring their acceptability.

#### *The user as a constituency*

If the image of design as the search for an optimizing solution within the context of a set of constraints is a powerful one, in part it is because it enables us to see design teams as composed of groups or clusters of vested interests representing these constraints. Indeed, it becomes possible to see the design team as a strategy for achieving optimization through representation, the negotiation model. Some of these vested interests, or constituencies, might obviously be aligned with design disciplines (mechanical engineering, electrical engineering, software); and others with the organizational context (management processes, quality processes, potential build sites). In addition, cross-cutting constituencies also emerged. The user was one of these. The Industrial Design and Human Factors group (IDHF) is formally regarded as a source of knowledge about and concern for user-related issues. On occasions it can exercise veto power, although its ability to do this depends upon the issue, the authority of the individuals representing IDHF in the decision-making gathering and the implications elsewhere in the design. Most of the time, though the representative of IDHF was expected to be monitoring any discussion for its implications for the user and to speak up on behalf of the user's point of view. Others (such as customer service and education, or marketing)

would also bid to represent users during the discussion of design features, the compiling of documentation, and the elaboration of what users would or would not want. The relative strength or weakness of the user as a constituency to influence design decisions is not straightforwardly a function of designer's concern (or otherwise) for users. It is, instead, a matter of trying to gauge what consequentiality to allocate to the expression of the users' point of view in the light of all the other constraints with which they are concerned.

### *The user as simulacrum*

Every account of design stresses its nonlinear nature. Different phases of design go on in parallel despite what the manuals on methodology recommend<sup>21</sup>. For designers this provides both an opportunity as well as an obstacle. In the case with which we are concerned, operability tests were running while some features of the basic design were still being (re)considered. These tests require experienced, technically sophisticated operators to follow a set of clear procedures which are supposed to ensure that the machines are used in the ways it is envisaged eventual end-users will treat them. So, although they run the machines for days on end, fix unforeseen and noncritical breakdowns, pull machines apart and put them back together, these operators are enjoined to follow procedures which would, if employed strictly, deny them access to knowledge they plainly have and need. As a consequence, the data which flows back from the operability tests has to be constructed so that estimations of the extent to which it simulates what users could and would do can be arrived at. Waivers have to be introduced, the significance of malfunctions extraneous to the purpose of each particular test assessed, and so on. Once all this has been accomplished, the extent to which these results can then be used to amend design decisions has then to be determined.

## **3** *Conclusions*

We do not imagine that any of the observations we have made would come as a surprise to practising designers. They well know the ways in which the user is present to design. What may be less familiar, though, is the patterning which this presence takes. The user is introduced into design through the use of typificatory structures. Our aim has been to show first that these structures conform to patterns and second that these patterns can be analysed using the concepts of personal and course of action types. These typifications form one of the structures of common-sense design reasoning in that they are known in common by designers and unproblematically deployed by them in the course of actual design decision making. Their availability enables them to be used as an explicit resource by means of which provision can be made in and through

**21** Sharrock, W and Anderson, R J 'Organisational innovation and the articulation of the design space' prepared for *Design Rationale* T Moran and J Carroll (Eds) Lawrence Erlbaum, Hillsdale, NJ, (forthcoming)

managing the day-to-day contingencies of design for the user to be incorporated within the design space. By invoking such typificatory structures, designers are able to construct the rationale for their design decisions within the flow of the designing. Seen from within the activity of design, in the midst of exploring the design space, these structures enable designers to construct their design worlds. External representations seek to represent the topology of these worlds as an overarching logic construed from the point of view of the designed artefact. They seek, then, the external configuration of the design which necessarily picks up where the structuring of design ends. As we hope we have shown, our approach is complementary to theirs. Taken together, they provide mutually informative accounts of the character of design reasoning.