DOING
RESEARCH IN
DESIGN

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way of introduction we can talk about praxis as the dynamic relationship between thinking and acting, between theory and practice.

The designer and the researcher act within a social realm. The work that they do is not private: it has the purpose of making a mark on the outside world and its structures. An aspect of the individual/institution dialogue that we have talked about above is the way in which institutions mould thinking. We have so far neglected the way in which thinking leads to acting. Like our definition of the designer as someone who designs, this might at first glance seem to be a very obvious thing to say; of course thinking leads to action. However, the dynamic relationship between thinking about the world (theorizing) and putting those thoughts into action is something that has obsessed philosophers since the ancient Greek philosopher Aristotle first talked about 'praxis'.

Praxis describes the way in which thought becomes action. In the models of habitus and field and lifeworld and system that we have discussed we have seen that there is a dynamic relationship between the circumstances that surround an individual and the ways in which that individual acts. Praxis is a way of approaching the dialogue between the two from yet another perspective, from that of the individual. Briefly, praxis is the term we use to talk about the interrelationship between thinking and acting, and reflecting on the result of our actions. It should be immediately obvious that designers need to continually consider how their actions impact the social world.

The reason we have spent so long discussing the position of the designer is to be able to finally make this point. If the designer exists within a social framework where ideas about design objects, practices and processes, and questions about their validity take place in a series of political, cultural and social contexts, then that suggests that these contexts should be taken into account when engaging in any design process.

Researching is already part of the design process, whether it is finding out about the problem that needs solving, researching the qualities of materials, working through the efficacy of a system or reflexively engaging with other designers or clients on a project. It is from this position that we argue for the usefulness for designers of research ideas and processes that have their origins in social research paradigms.

The next chapter examines how the designer thinks about problems and about finding solutions to them. Using ideas developed by designers who have reflexively engaged with design processes, we discuss ways of raising questions about design and research problems.

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WHAT DO DESIGNERS AND RESEARCHERS DO? THINKING, DOING AND RESEARCHING

Previously it was discussed how, using ideas drawn from philosophy and sociology, we can conceptualize what a designer does and how the individual designer might be placed into a bigger picture of social and institutional design values. We have argued that the central concern of designing is the transformation of the world, and in this chapter this idea is developed with the intention of enabling readers to apply their knowledge of themselves as designers to their developing understanding of the research process. Some time is spent identifying the ways in which designers think and the ways in which design thinking has links with research thinking. By the end of the chapter readers should be able to identify the similarities between design and research, and understand that research is a component of design. Later on, in the main body of the book, the appropriate research strategies for different design tasks will be unravelled, but at the moment we approach the relationship more broadly.

In order to understand the relationship of the design problem to its solution, an exploration of the role of the research question is central. A problem is a difficulty that presents itself and needs a solution. It is a condition or a circumstance where there is gap between what we want or need to happen and what is actually happening. The questions that are asked about problems are central to understanding what the problem is. Problems for designers exist at every level of designing, from overarching issues such as managing river flooding to small issues such as finding a suitable adhesive for foamcore boards.

Over the last fifty years, ideas about the ways in which designers think have centred on the jump that the designer makes from thinking about the problem to ways of solving it. These 'creative leaps' are not the sole preserve of the designer, though designers exploit them in their discipline more than others. Such leaps are colloquially ascribed to intuition, but here we develop the idea that just as the brain thinks logically and procedurally so, too, there are ways in which the brain comes rapidly to conclusions based on accumulated bodies of information. This rapid decision-making is the subject of continued study because the rapidity in which decisions

are made is difficult to follow (Lehrer, 2010). Philosophers have called this intuitive way of thinking, 'abductive' thinking. By categorizing and examining the way abductive thinking is related to solving problems, it is possible to gain an important insight into the designer's thought processes. We suggest ways in which research can amplify and work with this insight, principally by aligning research thinking as closely as possible to the habitus and lifeworld experience of the designer.

We shall also discuss 'wicked problems': problems that are so complex that they have no single solution, are in fact never solvable, and require continued
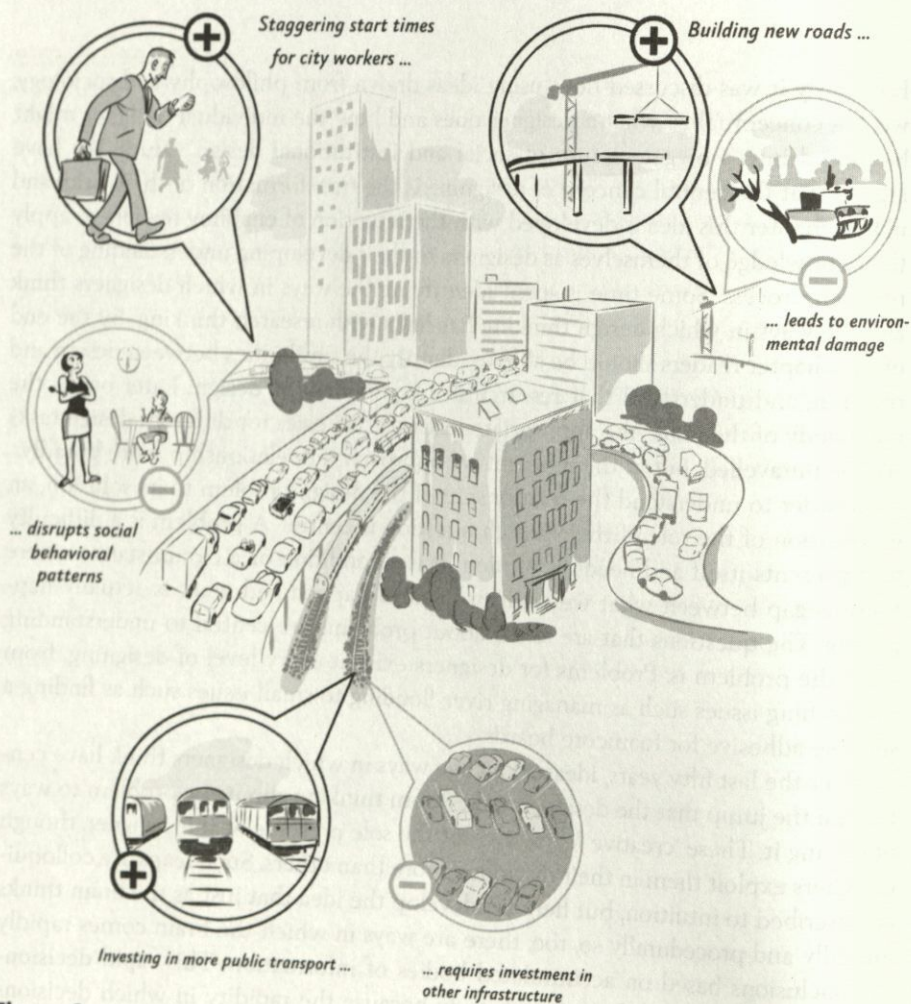

Figure 2 Wicked problems (Stuart Medley).

research in order to be kept within our understanding. In the light of their com-plexity, collaborative design principles, where problems are addressed by designer and user together, are often the way forward in dealing with complex design problems, and in such cases research is of paramount importance. The contingent nature of solutions for wicked problems, where 'solutions' are qualified by further conditions or circumstances that follow on from the first in a continuing train of transitional resolutions, means that the researcher needs to have a broad grasp of how differing aspects of problems are interrelated. At the end of the chapter the idea of 'sensitizing concepts' is raised as a way of framing problems that provide the researcher with a variety of perspectives that enable different readings of the same issue.

Initiating change

Designing and researching are not new partners. Designers have always thought about what they do and have always researched information to help them tackle the tasks they are faced with, but the history of the formal relationship between research and design as we know it today goes back to the founding of the Design Research Society in the United Kingdom in 1966. The society was formed out of the interest generated by a mould-breaking conference in 1962, the 'Conference on Systematic and Intuitive Methods in Engineering, Industrial Design, Architec-ture and Communications'. It was held at the department of aeronautics at Impe-rial College in London, and the intentions of the convenors were in part to erode the discipline boundaries associated with different specialist design activities in an attempt to discover the links between them. It represented an important insti-tutional response to the new conditions that surrounded design. The importance of thinking about the broader function of design and the functioning of designed goods had increased after the Second World War as social dependence on designed industrial goods became ubiquitous. Increasingly the everyday life of the western consumer was one lived inside a designed world. In his book *Design Methods*, first published in 1972, John Christopher Jones (who had been one of the conference convenors and was a key figure in the founding of the Design Research Society) wrote that:

> Perhaps the most obvious sign that we need better methods of designing and planning is the existence, in industrial countries, of massive unsolved problems that have been created by the use of man-made things, e.g. traffic congestion, parking problems, road accidents, airport congestion, airport noise, urban decay and chronic shortages of such services as medical treatment, mass education and crime detection. These need not be regarded as accidents of nature, or as acts of God, to be passively accepted: they can instead be thought of as human failures to design for conditions brought about by the

products of designing. Many will resist this view because it places too much responsibility upon designers and too little on everyone else. If such is the case then it is high time that everyone who is affected by the oversights and limitations of designers got in on the design act. (Jones, 1991, p. 31)

This is an important observation that we have included in its entirety to reinforce the centrality of the function of design as a means of identifying and solving problems that exist in the world. These are often problems that are to do with the effects of both designed objects and designed systems. In the introduction to his book, Jones argued for a vision of design that could be understood not just by its processes but also by its results, and suggested a definition of design as something that initiates change in man-made things (Jones, 1991, p. 4). The purpose of a solution is to initiate change in order to resolve the problem, and this relationship between problem and solution has become a central one in contemporary ideas about the ways in which designers think (Lawson, 2008). If design is about initiating change in man-made things, and we would suggest that there is such a compelling body of opinion around this proposition that it can be assumed to be the case (Berman, 2008; Brown, 2009), then the questions of why change is needed and how it is best facilitated are both central to designing and researching.

If we return to Jones's observation about the problems caused by man-made things, we can see that its wider implication is that it is necessary for the designer to understand the interconnectedness between design decisions and their outcomes, and hence take notice of the broader social consequences of design and designing. By taking an example of a problem that he raises—the issue of 'parking problems'— we can elaborate on how the act of initiating change can in this case be more broadly contextualized as having effects in the social realm. Let us assume that the problem surrounding parking is a lack of car parking space in a historic town centre that was designed before the advent of the motor car. One solution might be to design an object and build a car park; the other might be to design a system and increase the provision of public transport so that drivers choose not to drive into town. In 'solving' the problem, both approaches have added further material consequences to the original problem. In the first instance, the way the physical nature of the town would be changed would in turn alter how civic space is both used and thought of. Where is the car park to be situated? Is it an open block or multistoried structure? Does it sit in the centre of the town or on the edge? In the second instance, an efficient public transport system might considerably diminish the use of private cars, which in turn impacts on the collection of parking revenue available to maintain civic spaces. From these initial observations emerge the even bigger considerations of how private and public access to shared spaces is managed, how environmental issues might impact upon designing for communities, and how the rights of citizens to use their cars wherever they want is compromised. The 'solution' and the 'problem' are thus obviously intertwined, and without some kind

of initial scoping of the consequences of a design decision, the success of the design is likely to be only partial.

Thinking about questions, problems and solutions

How does research relate to this concept of the design problem and solution? Bryan Lawson in his book *How Designers Think* (2008) maps out the nature of problem and solution in design thinking. We want to look at his main ideas and match them to research thinking. We must also make the point at this early stage that both a design 'problem' and a research 'problem' are different from a design or research 'question'. We will be talking in more detail about this in the methodology chapters, but it is useful to establish our terminology early on. A problem can be considered as an unresolved dilemma or circumstance, or an obstacle to the resolution of a task. A question, on the other hand, is an intellectual tool for eliciting information and, in relation to design and research, it's a way of eliciting information about strategies for resolving dilemmas or the resolution of a task. We think that the introduction of the question into the mainstream contemporary thinking about the problem/solution dialogue is a useful addition to ways that designers might think about researching.

Lawson suggests that design problems cannot be comprehensively stated because of the impossibility of being sure when all the aspects of a problem have emerged (2008, p. 120). In research, a problem might need a question to act as a starting point to resolve what the problem actually is. The problem and the question about the problem move backwards and forwards with one another, and it is this asking of questions that stimulates ways of finding solutions just as much as determining what the problem might be. For example, an increasing shortage of water for suburban gardeners in Australian cities means that 'traditional' lawn-based, water-hungry gardens cannot be maintained. This problem of water shortage can be framed in a number of ways. By asking the simple question, 'Is the problem the shortage of water, or the gardeners' demand for it?' the problem is still rooted in the fundamental condition of water shortage, but the problem is no longer just about a lack of water. It's also about how water might be managed better. Another question might ask whether there is a shortage of water because of a decrease in the amount of water available or because of an increased demand for what is there. What at first might appear to be a problem about how to get more water to users (that could be solved in part by rationing) can be reframed by making the problem an eradication of the need for water by reducing the need for it (solved in part by encouraging the planting of drought-resistant native plants). What started as a single problem, through judicious questioning, becomes a series of different problems with different solutions.

Lawson says that design problems 'should be seen as in dynamic tension with design solutions' (Lawson, 2008, p. 120), and this makes sense if problems are conceived not just in abstract terms of materials and product (water and use) but also in

terms of initiating change (why water is used) through the strategic asking of questions. If we place design and research into a social context then what constitutes a problem will shift as ideas in social and cultural contexts change. It is impossible for us to determine the value of either things or information, or to determine what problems might be, without making reference to the dialogues that take place between ourselves and the institutional values that construct the practices we engage in. To explain this point we can say that the shortfall of water needed to maintain a dazzlingly emerald lawn in Australian suburbia is after all only a problem if one thinks such a lawn is a desirable addition to the world. Lawns are disastrous environmentally, but for many who possess a lawn they are seen as aesthetic necessities. A native garden full of plants that need little water encourages native birds and insects but looks ill-disciplined to those whose aesthetic sensibility has been framed by a tradition of gardening based on English parks management. Given the fraught relationships between habitus and field, it should not come as a great surprise to us that problems of this nature can be difficult to define and fully uncover.

Lawson's next point reaffirms this notion of contingent value. He observes that 'design problems require subjective interpretation' (2008, p. 120). This is affirmation that, far from being the objective, scientific activity that modernist designers such as le Corbusier and Walter Gropius said it could be, design is as subject to the vicissitudes of the subjective struggles in the field as every other discipline. Lawson makes the point that an understanding of design problems and the information needed to solve them depends on our ideas for solving them. We have addressed this issue in the paragraphs above, but it is worth adding that subjectivity is both a tool for making creative jumps as well as also being a handicap in research unless one reflexively engages it. The experience of the habitual mower of lawns frames the world differently from the experiences of the bush walker, and if the individual can acknowledge his or her subjectivity and realize that personal approaches to a problem can both frame the problem imperfectly and provide an interesting insight, then that is a useful default position.

Lawson's last point about design problems is that they 'tend to be organized hierarchically' (2008, p. 121). By this he means that problems are interrelated and follow on from one another. He suggests that it is beneficial to 'begin at as high a level as is reasonable and practicable' in addressing them. For the researcher this is a useful strategy, too, but it does not preclude breaking the problem down into its interconnecting parts before attempting to find ways of addressing the overarching or meta-problem. This research view is intimately connected with one of Lawson's observations about design solutions. 'There are . . . no optimal solutions to design problems but rather a whole range of acceptable solutions' (Lawson, 2008, p. 122). What we can extrapolate from Lawson's observations is a model that suggests a network of problems and solutions in design that are in a constant state of play with one another. Nigel Cross in his book *Designerly Ways of Knowing* reinforces this 'co-evolution' (2006, p. 114) of the design problem and solution. He acknowledges that

there is 'still considerable work to be done to establish a reliable understanding of design cognition' (p. 114), but even with this qualification it appears that research into how designers practice reveals that this constant dialogue between problem and solution—where one feeds the other—is fundamental.

We can summarize what has been a dense and discursive couple of pages in these key points.

- Design and research are about initiating change in man-made things.
- Initiating change puts design into the social realm, where research already sits.
- The dynamic relationship between problem and solution in the social realm means that a solution is never in itself complete, and may well reveal, or create, new problems.
- A question is the mechanism that can model the problem/solution dynamic.
- The role that individual subjectivity plays (in framing problems, questions and solutions) needs to be acknowledged as both a help and a hindrance in these processes.

Thinking productively and abductive thinking

Jones builds on Broadbent's views (1966) that originality is hampered by routine on one hand and wishful thinking on the other. Broadbent goes on: 'These are evident when a person acts either in a far more regular way than the situation demands or else is incapable of perceiving the external realities that make his [sic] ideas unfeasible' (Broadbent, 1966, p. 29). We would further argue that the role of the research question is to help elucidate not only the problem/solution dynamic but also to create a space in which the individual can take stock and see a space between the two where they are able to engage with that dynamic. The question thus becomes part of a broader reflexive engagement with the problem.

We can further develop Jones's point that routine hampers originality by introducing the idea of a 'paradigm'. A paradigm is the generally accepted view about a topic within a discipline or within the field. Paradigms can be challenged and tested in the field as we have already seen. Those paradigms might be intellectual, ideological or be based on outdated research into what materials can do. A good example of the shattering of paradigms in design is the invention of television. As Raymond Williams points out in his book *Television: Technology and Cultural Form* (2003) the majority of the technology that was to be used in the development of television in the 1920s had been available for forty years or more. What stimulated the amalgamation of parts into a unified artefact was what he calls the 'social dimension' (2003, p. 10) in which new ways of thinking about images and their transmission changed the paradigms of why and how it could be achieved. Routine is something that is governed by paradigms, and routine is the expression of the limits of an 'accepted view'. Questions are useful ways of finding out about the limits of paradigms for sometimes they are self-imposed limits on thinking about subjects and practices. Given this we suggest that when designers and researchers work towards a goal they are also engaged in intellectual processes that include:

- evaluating paradigms of practice;
- interpreting paradigms of practice;
- identifying problems;
- assessing/evaluating problems;
- using intellectual tools to conceptualize/analyse/make meaningful a problem, to make it capable of being understood or solved;
- testing intellectual and practical paradigms to understand/solve the problem.

Engaging in these intellectual processes helps to resolve existing problems and/or develop new ones. The same processes also apply to solutions.

Cross makes the point that the 'ill defined nature of design problems means that they cannot be solved simply by collecting and synthesising information' (2006, p. 52). The solution to a problem emerges during the reflexive process of its resolution, and information gathering and ordering are not enough *by themselves* to provide solutions. The 'opportunistic' resolution of a problem that suddenly appears as if from nowhere is sometimes called intuition (2006, p. 52). We would like to develop Cross's suggestion that, rather than talk about 'intuition', it is better to talk about 'abductive' thinking. We wish to widen his view of it as something that is particular to design thinking and suggest that it is a way of thinking that can be found in research and indeed in any form of practice that requires a solution to a problem.

The debates around how it is that we can make jumps into new knowledge based only on what we already know goes back (at least) to Plato (1901). Rather than recommend the reader to hasten to their Plato, it is probably better to start with Charles Sanders Peirce and John Dewey. Both of these philosophers identified that the ability to acquire new insights or new understandings of a subject, seemingly without prior study, is a particular way of thinking akin to others that are more readily identified, such as inductive and deductive thinking. This transformative way of thinking they called abductive thinking. Peirce suggested that deductive thinking proves something must be the case, and inductive thinking shows that something is in operation (Hartshorne & Weiss, 1934). Deductive thinking allows us to reason that orange peel left on a tabletop indicates the past presence of a complete orange or of a person eating one, because deductive thinking is based on logic and allows us to make assumptions that should be correct. It is inductive thinking that might lead us to think that orange peel and kitchen tables are operationally related. Inductive thinking points out relationships, and can be the basis for providing theories about what may or may not be the case about the relationship between things or information. While inductive thinking can encourage speculative thinking, it is through abductive thinking that we are able to make leaps that connect information together rapidly, and decide about how things *might* be put together to make sense of them. Abductive thinking encourages us to think what *might* happen, or what *might* be the case, or what could happen if things were rearranged. Abductive thinking often takes place unconsciously and decisions are arrived at quickly, hence its colloquial name 'intuition'. It is abductive thinking that could lead us to see orange peel on a

kitchen table and view it as the ideal material for making scary orange teeth that, having been shaped with a kitchen knife, can be inserted skin facing out, serrated edge down, under the top lip.

All these categories of thinking are directly applicable to the process of designing. Let us imagine there is an issue with the use of hardwood planks used for flooring in a wooden frame house. Hardwood planks are useful in such construction because they can be screwed down easily to floor beams with power tools, they are hardwearing (unlike soft woods) and they are a material that homeowners find aesthetically attractive. The problem is that they are both expensive and environmentally unsustainable. Thinking deductively it follows that if hardwood planks have been traditionally used as flooring, and if their use has proven to be successful for practical and aesthetic reasons, then the continued use of wood *in some form* would be advantageous as a flooring material. Inductive thinking that identifies the operational relationship between floors, wood and users allows us to form ideas from our observations about the kinds of flooring that homeowners prefer. Abductive thinking, however, allows the designer to develop his or her deductive observations and make a jump from making planks from unsustainable hardwood to using sustainable hardwoods reconstituted into plank form. In the eighties and nineties, teams of designers looked at the potential for bamboo, used traditionally for thousands of years, to be used industrially. Understanding the lateral strength of bamboo, and understanding how bamboo has been used traditionally in woven form to create strong containers and panels, a system was devised in which the fibrous strands of bamboo poles were first separated out, then woven together again (to increase their strength), and finally compressed under heat and extreme pressure in moulds in standard plank lengths. The finished product appears to have a linear grain like a solid plank and has the same aesthetic qualities. Treated this way, bamboo becomes twice as hard as oak and is therefore extremely durable. It has the benefit of being quick growing and therefore sustainably managed, and cheap to harvest. How did the jump from a hollow pole of variable diameter into a simulation of a logged and sawn hardwood plank take place?

Common sense dictates that abductive thinking has to come from a base set of experiences. There has to be preparedness for making abductive decisions so that when different issues are put together for the first time, the individual is able to make that imaginative jump from one issue to the other and then back again. Without an understanding of orange peel's material qualities, there can be no realization that it can be cut into new shapes. It is equally unlikely that someone without knowledge of bamboo's properties and how it has been traditionally used could conceive that its cylindrical form can be so radically altered by heat and steam. Equally, why conceive of the transformation of bamboo into planking without the initial need to recreate planks? The designers who saw the transformation of one set of qualities (narrow vertical poles) into another (wide horizontal boards) needed an intimate knowledge of both sets of information to be able to make that transformation. There is an element of metaphorical thinking being used here as well,

comparing one thing with another in order to understand it better. The often-used description by town planners of parks as the lungs of urban communities is a powerful metaphor that conveys the need for green spaces in industrial cities far more potently than would a didactic position that lays out the deductive thinking behind the need for them.

In acknowledging the complex nature of designing, Cross quotes the structural engineer Ted Happold who worked on the Sydney Opera House and other landmark international buildings and who founded the United Kingdom's Construction Industry Council. 'I really have,' said Happold, 'perhaps one great talent; which is that I don't mind at all living in the area of total uncertainty' (2006, p. 53). It is uncertainty, the rejection of routine and the questioning of paradigms, that creates the open space in which abductive thinking seems to thrive. To relish uncertainty as a condition for abductive thinking is as valuable for the researcher as for the designer. Abductive thinking is an intellectual tool that crosses disciplines, and is as much use to the researcher as deductive and inductive thinking.

Wicked problems

The limits of deductive and inductive thinking are revealed by the concept of the wicked problem. The wicked problem concept emerged from social planning and as a phrase has its origins in an article published in 1973 by Horst Rittel and Melvin Webber (Rittel & Webber, 1972). A wicked problem is a problem that is highly resistant to any kind of solution and is contrasted to the idea of the 'tame' problem. The tame problem is not necessarily a simple one, but one that can be readily defined. The wicked problem is a problem that responds to different formulations depending on who is asking the questions about it. We can say that depending on one's habitus or lifeworld experience, or dependent upon one's social, cultural and symbolic capital, a problem could be interpreted from many different viewpoints. When the problem becomes lost in the middle of multiple causes and when different formulations of the problem generate multiple solutions, then we can say it is wicked.

A wicked problem stretches the problem/solution dialectic we have established almost to breaking point. It may seem odd for the authors to set up a way of thinking and then attempt to demolish it, but we are doing so deliberately because that is what researching is like. The model of problem/solution we have discussed before is one that is commonly seen as being central to design, and works well when the problem is seen from a controlled set of perspectives. However, by its very nature this dialectical formulation implies that ultimately there is a solution to a problem, and all that is needed to ensure the success of this dialectic is the use of significant questions. We have observed already that a solution might in turn create new problems, but our observations up to this point have assumed that a problem is solvable. The issue of the wicked problem is that the problem/solution dialectic is framed from different vantage points with multiple value systems and conflicting goals.

Rittel and Webber suggested that there is no definitive formulation of a wicked problem because the problem and the solution are the same thing and every time a solution is proposed it changes the nature of the problem. This is a very different proposition to the idea that a solution may create new problems. Let us return to our previous example of parking problems in a historic town centre. The way in which we analysed the problem previously was to say that there is a problem parking cars because there is not enough space. We knew it was a complex issue and were aware that our different solutions formulated new problems. We framed the initial problem as something that was solvable though, and despite realizing that different solutions would cause fresh problems, we didn't question the initial framing of the problem. We went to the problem looking for a solution. Perhaps what we should have done was to look at the problem and say, 'There are so many factors impacting on this single issue, that to try and resolve it in isolation is impossible.' It would be wise at this point, when defining the design problem, to decide that the issue of parking cars is a wicked problem.

The idea that there is no solution to a problem is anathema to the orthodox designer or researcher. It seems to fly in the face of everything that a designer or researcher does, but we would argue it is actually a far more common experience than is generally acknowledged. When we can get used to the idea that not everything can be solved from a specialist perspective and that collaborative strategies are sometimes needed to do even simple things such as frame a question about a problem, the nearer we are to finding ways of managing design and research problems.

So in addition to our previous observations, we could now suggest that in understanding the relationship of the problem to its solution we must realize that sometimes there is no solution to a problem. We would argue that this realization, that the designer and the researcher possess strategies to engage in their tasks but that sometimes these skills are not enough in themselves, is a liberating one. This is because it makes us think about:

- using multiple systems,
- being flexible in our approach to problems, and
- working collaboratively.

Most problems are thought to sit on a continuum between the tame and wicked (Australian Public Services Commission, 2007, p. 6). This implies a sliding scale. A better metaphor is that tame problems sit within wicked ones. This we think gives a better indication of how the complex network of interaction takes place. A series of tame problems surrounding the parking of cars sits within the bigger wicked problem of cars and their use. If problems are looked at in this way, the contingency of solutions becomes much clearer. Some design problems can be solved through the production of an object; some research problems can be solved by the gathering of information. However, it is frequently the case that the way in which our lifeworld is colonized, and the way in which our habitus is formed through negotiation with

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institutions in the field, render the interconnection of design practices and other issues opaque.

We can see from our discussions of the problem and its relationship to the solution that a whole range of skills are shared between designing and researching, because both of the skill sets are linked fundamentally in their engagement with the social realm—the way in which it is constructed, physically and intellectually, and the way in which that construction throws up other issues. The wicked problem initiates as many fresh challenges, whether its solution is addressed as a research question by a designer or by a researcher. Asking questions is fundamental to both the researcher and the designer; sometimes questions are framed inductively, sometimes deductively. In both designing and researching, the definition of a problem is fundamental to its solution, though sometimes the problem is unsolvable. We suggest that the question is an important tool in fashioning an understanding of what the problem is. By asking questions we can evaluate how problems sit in habitus/field relationships.

Empirical designing and researching

Some design problems may seem initially to sit outside the framing of them in this chapter. Functional items such as knives and forks, for example, may appear to be designed solely for use, and any research around them might appear to be of a purely empirical kind. Empirical research is the name given to a way of gaining information through the observation of observable phenomena. For example, what happens when materials are tested for suppleness, strength or longevity or designs are tested for their usability? In our cutlery example we might need to test how well balanced the pieces are, check the durability of the materials they are made from or assess how comfortable they are to use. In research like this, deductive thinking is used to deduce how useful or effective a planned design might be. Empirical research for design tends to be based around inductive and deductive thinking, where facts are gathered, ideas are formed and testing and evaluation takes places. We will talk about this process of planning, acting and reviewing in more detail and in relation to the idea of praxis in Chapter 3, and with regard to action research in Chapter 9. An examination of the history of cutlery and of the cutlery available in shops will quickly reveal that while empirical research into the use and economics of the materials used to make cutlery might be absolutely necessary, this research is counterbalanced by other issues which impact upon the way cutlery is used. Ideas about styling, marketing strategies that tie functional items up with bigger style trends, ideas about planned obsolescence and ideas about conspicuous consumption all impact upon cutlery's appearance. Even that most utilitarian of Western cutlery items, the spork, a functional hybrid of a spoon and a fork that is used extensively by campers, the military and fast food restaurants, can be found in different forms. Sometimes the fork tines project out from the spoon bowl and other times the tines are designed sitting within it. The

spork can be made of stainless steel or plastic, the use of materials determined by efficiency, but whose? Is it efficient to throw away plastic cutlery? It is cost efficient for those catering institutions that don't wish to go through the procedural bother of employing people to wash cutlery to throw dirty, cheap things away. But framed inside a bigger picture of sustainable production, resources management and waste disposal, the role of cheap plastic sporks need further examination. The spork designer sits within the field of cutlery design, but this field overlaps and interlocks with other design and social fields all with their conflicting ideological demands. We would suggest that even attempting to define function is a wicked problem.

Collaborative designing and research

Just as the individual designer is connected to networks of interlocking ideas, he or she is also always connected to other designers, systems and users. Designers have to think of their relationship to the processes and people involved in the change that their design initiates whether they are working independently or as part of a concept development team. At the heart of their practice, designers are people who have to work in cooperation with others. Sometimes designers choose to develop their skills by working with others; in other cases, the nature of design tasks are too complex to approach intuitively and singlehandedly: the design of a railway system for example, or a network of drains for a new housing estate or the evolution of a computer game. Complex design problems can no longer be solved without some kind of research. We now briefly introduce two examples of the way in which the designer has to work cooperatively, using the concept of co-design and the function of teamwork. We are doing this to show that inherent in the act of cooperation is also the act of research, even if the research operates at an abductive level. 'I wonder what the client will think of this?' is, after all, a potential research question even if it is not framed academically. We want to frame co-design and teamwork as activities that demand that the designer thinks in terms of interrelated activities that complement design creativity rather than limit it. If we can establish the value of this networking attitude as it currently exists in designing, it will be clearer for the designer to then understand how researching can become part of creative networking processes.

Co-design is a shorthand phrase used to cover a variety of design activities that all share the basic principle that the design process includes other participants, either individuals or communities, in the process of designing a solution to a problem. In research this is often called participatory action research (the process of which is developed Chapter 9). Co-design can also refer to the bringing together of human thinking and practices and machine systems, the development of which has increased exponentially as digital technologies have advanced. Co-design was first articulated in architectural design (King et al., 1989) where

cooperative and collaborative work by architects and end users led to a very different kind of designed environment, one that was in distinct contrast to the rigid town planning that characterized much of the sixties and seventies. Co-design tried to incorporate the lifeworld of the urban user of social space into the built environment, with the ambition that 'the economy, community, ecology and the whole way of life of [the user's] day' (Day & Parnell, 2002, p. 10) was integrated into a design. This approach has led to urban successes similar to the community design project in Bangalow in New South Wales, Australia, where the community was involved in the redesign of their small country town (Sanoff, 2000, pp. 231–239).

The success of this and other similar projects, which range from large scale architectural down to small scale disabled handicraft projects (Peters, Hudson & Vaughan, 2009), were the direct consequence of the partnership between design and user. The need for the designer to work alongside the user is a logical development of the client-based work that is the traditional staple of the designer, but in co-design of this sort the relationship is deeper and more intense. It is about changing the fabric of the man-made world with the focus on why and how change should be initiated and with the associated problem-solving shared between the designer and the end user. (In the chapter on narrative methodology we will discuss in more detail the role of narrative research, in which stories and life histories are researched to give insights into social practices that can be used to understand the habitus or lifeworld of the end user of a design.)

In some ways this kind of research is closer to the intimate relationship the crafts-person had with the user of their goods before industrialization. It was industri-alization that formalized and codified the practices of the designer into specialist areas to suit the needs of mass production, as the production of standardized forms of objects was a necessary part in the construction of an early consumer society. Co-designing is a development of a closer relationship with the individual user of design that mass production precluded. The co-designer is still an initiator of change in the man-made world, but co-designing principles suggest that the designer is also a mediator of change. The act of mediation requires an understanding of systems and how they interconnect. This kind of understanding cannot be acquired without research on the part of the designer.

Co-design also plays a role in the evolution of commodity design. It is over a decade since Gilmore and Pine wrote their article 'The Four Faces of Mass Customization' for the *Harvard Business Review* (1997). In it they examined the ways in which designers of business models were responding to the new opportunities in marketing and production largely afforded to them by the advent of what were then new digital technologies. Gilmore and Pine proposed that the future trend for mass producers of commodities was a form of mass customization of goods and services. They argued that consumers could no longer be thought of as members of a homogeneous market grouping, their research revealing that consumers often

customize the commodities they buy. (Gilmore and Pine use stronger language, saying that consumers are 'forced to modify' the products they buy.) It is true that those of us without recourse to *haute couture* clothing may change buttons or hems on mass-produced clothing, that shoes do often need insoles inserted, and that flat pack furniture may sometimes need adaption to fit the awkward corners of strangely shaped rooms. Gilmore and Pine however build an entire case around the need for consumer driven processes, arguing that 'collaborative customization replaces such back-end solutions with front-end specifications'. They argue that unlike the distributors of mass goods that wait for consumers to come to them, a collaborative approach not only delivers the commodity to the consumer but also customizes the delivery system. 'In effect' they say, 'there is no supply chain anymore; instead, a demand chain is created.'

The implications for the designer and the researcher of this adaption of co-design's origins are that design is no longer just about producing objects but also about designing the systems that facilitate the procurement and transport of raw materials and the production, distribution and marketing of objects. In such complex conditions new knowledge about design has to emerge from research into design, and the designers need research to understand the problems that they face. Working within a team becomes the only way in which these complex contemporary design problems can be fully identified and resolved. If one looks at the ideas promoted by the Next Design Leadership Institute, what is clear is that a new conception of design is emerging (what the co-founder of the Institute, G. K. Van Patter, calls social transformation design) in which the concept of multiple stakeholders and organizations interacting with multidisciplinary design teams will increasingly become the norm. This is because it is the only way in which wicked problems can be fully addressed. This does not mean that old design practices disappear. Rather, they become incorporated into the bigger design picture where design is no longer seen as a series of objects and events but as a network of ideas and practices. Using the design and research skills that are needed to solve problems within a collaborative network might involve working individually or as part of a team. Whatever the case, team-based and networked designers need clear communications frameworks as working as a team member requires additional skills to those that are used when the designer is working alone.

There is an increasing dialogue between design and research in the contemporary design field. New practices in both fields inform the other, and just as it is clear that the networked designer is designing differently from the designer working on his or her own, so too the researcher is part of a wider community, what Wenger (1999) calls a community of practice. Wenger and Lave's observations, which may seem obvious now they have been absorbed into mainstream thinking, are that individuals do not learn on their own but in a social environment. It follows from this that gaining knowledge is not a process of individual acquisition but achieved by participating socially. The need to understand team behaviour and the processes

of collaboration becomes very important once this is understood. We would again propose that researching and designing are fundamentally linked activities in our new contemporary circumstances.

Thinking about research

There is a burgeoning group of designers and researchers engaged in contemporary discussion about research into design. The designer Gui Bonsiepe is a key figure in this community of practice because he is unafraid to frame big questions about the nature of design and research. He is both a prolific and practical designer and has proposed, 'The material base of products with their visual, tactile, and auditory conformation provides a firm base for the designer's work' (2006, p. 33). This pragmatism—which connects him directly to Jones's ideas of half a century ago about design and change—does not mean he is interested only in the material world. He uses this example to demonstrate that design is not solely about styling and how that styling communicates (sometimes referred to as the semiotics of design), but also concerns the ways in which design affects the world in any number of ways. He has proposed a design 'humanism' which he suggests is a form of designing organized to interpret the needs of social groups, in order to 'develop viable emancipative proposals in the form of material and semiotic artefacts' (2006, p. 30). Bonsiepe has spent his career talking continuously about the function and purpose of design in this way, trying to frame design practice within the field where it currently sits with the intention of repositioning it and framing new ways of thinking about it. His theorizing about design is also a form of research into design.

This framing of attitudes and principles towards design practice can be thought of in terms of what researchers call 'sensitizing concepts' (Patton, 2002). These concepts are theoretical devices that provide ways of starting to understanding the things or ideas we wish to research. Framing and organizing information in a thematic way through sensitizing concepts allows us to find a way to interpret it. We have already used concepts in this way. We have talked of habitus and field and lifeworld and system in the first chapter as a way of beginning to analyse what design is. In this chapter, by using the concepts of co-design and team designing to further understand the field of design as it currently exists, we are developing ways to interpret what is happening in the field and to explicate its values.

In his essay 'The Uneasy Relationship between Design and Design Research', Bonsiepe (2007) argues for the indispensability of research in contemporary design, and proposes a way of thinking about the sorts of design research that are taking place. The sensitizing concepts he uses to make sense of current research in design are 'endogenous research' and 'exogenous research'. By endogenous research he means research that has sprung up spontaneously from within the field of design. This kind of research has emerged from the material conditions of the act of

designing and is then returned back into the body of knowledge about design. It is a very concrete form of research, based within the discipline of design. Bonsiepe's aspiration for such design is that knowledge that emerges from research *within* the design disciplines then has the potential to be transferred to other disciplines. On the other hand, exogenous design research is the kind of research that looks into design practices from *outside* of the material conditions of acts of designing, and looks at design through the lens of other disciplines. Bonsiepe observes that this kind of research into design, while useful, is removed from the internal contradictions and confusions of designing itself. The danger is that research removed from an understanding of the internal contradictions of designing can lead to sweeping demands and judgements as to design's purpose. This makes it clear to us that the need for designers to do their own research and thereby to shape discourses about designing is paramount.

One way into the process of thinking about design is to ask questions that are framed by particular themes or 'sensitizing' concepts. The sensitizing concepts that we use in this book are centred on four ways of thinking about the design process that provide useful ways of starting to think about research. They are the designer, the object, the system and the end user. The ways in which they are used throughout the book are straightforward. The concepts provide ways into the initial ordering of your thoughts about the kind of research you choose to do, and will assist you in choosing the research methodology you will eventually use. As a first step towards identifying how ideas about the research process might be applied to your own research circumstances, you might wish to ask orienting questions similar to the following, bearing in mind that your own sensitizing concept might be an amalgam of the four we are using here.

- The designer. Does the research you are engaged in examine:
  - An individual's approach to designing objects or systems?
  - The ways in which an individual fits into a collective approach to design?
  - How an individual designer has achieved his or her design outcomes?
  - How you have approached solving a design problem?
- The object. Does the research you are engaged in examine:
  - The materials and processes used in the manufacture of an object?
  - How the object fits into a commodity market?
  - How the object has been conceptualized?
  - The social use and impact of an object?
- The system. Does the research you are engaged in examine:
  - The ways in which a system has been designed and functions?
  - The ethical or environmental impact a system has on a community
  - The ways in which a system can be established, modified or curtailed?
  - The collaborative nature of designing a system?
- The end user. Does the research you are engaged in examine:
  - The way in which the end user interacts with a system or object?

- o The end user's design needs?
- o The end user's design wants?
- o The way in which the designer can interact with the end user in the design process?

The next chapter moves into a discussion about what research is, the way in which it relates to design and how it affects our understanding of what design practice is and what it does.