# On the Self-Construction of Design Problems

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ABSTRACT

Extending the author's recent work (2007) this paper advances the argument that, in significant ways, *designers construct the problems they seek to solve*. While it is generally taken as read that design problems are presented to designers by external agencies (clients) and with specific requirements (the brief), conventional understanding assumes that it is *this* problem that the designer 'solves', and that differences between solutions may be accounted for on the basis of differences in the skills/creativity of individual designers and/or of the plurality of different 'satisficing' solutions that design problems allow. While acknowledging both of these assertions this paper argues that it is *not* this 'problem-as-given' that the designer 'solves' but rather a *substantially revised and personalized problem, the 'problem-as-design-goal'*, that both subsumes the original problem and imposes upon it a range of designer preferences, prejudices and expectations. Hence, starting from the same brief, different designers will necessarily produce different outcomes not merely on the basis of differential skill sets but because, in substantial ways, *they are solving different problems*. The paper briefly explores four key issues arising from this personal projection of self onto problem:

(i) how such problematization not only determines the nature and suitability of the 'new' problem but also informs and significantly constrains the nature of acceptable solutions and the criteria for such acceptability;

(ii) hence how, contra the received view that problem definition and analysis precede solution attempts, problems and solutions are co-extensive and mutually informative;

(iii) how such personal projection is often intuitive and unconscious, hence the role of education in revealing ideology, belief structures and theory commitment in designers; and

(iv) how the designer's vision is connected to and reconciled with the client's vision and requirements.

## INTRODUCTION

For many years conventional thinking about design and the design process has either tacitly accepted or explicitly maintained two propositions: first, that the design process is initiated by an external agent, identified as the client, who, on the basis of a set of extant requirements, commissions the designer to produce an outcome that will satisfactorily meet such requirements; and, second, that, while this set of specific requirements, nominally the brief, does not provide, automatically and without further expert input, a direct specification of the outcome *per se* – to do so would suggest that the design is already to hand and thus make the role of the designer nugatory – the input required of the designer comprises a comprehensive analysis of the brief, undertaken in the light of, and informed and augmented by, the expert knowledge of the designer, such that the most appropriate outcome for the given requirements may be determined.

Five further tacit assumptions that circumscribe conventional thinking about design follow from these.

### A. Design as a Problem-solving Process

First, it is often taken as an article of faith within design circles that the initial set of requirements established by the brief, and the as-yet-to-be-determined outcome which will satisfactorily meet such requirements, can be construed as *problem* and *solution* respectively, and thus that the process of 'moving' from one to the other – the design process – constitutes a *problem-solving process*.

### B. Design as a Rational Process

Second, and notwithstanding the creative nature of the designer's input, and thus the creative nature of the final output – despite its ambiguity, and usually without further elucidation, 'creativity' is taken as an expected characteristic of design – the process of arriving at a satisfactory solution is most often presented as being a *rational process of thinking and analysis* based on expert interrogation of the brief and the application to the project requirements of appropriate solution strategies.

### C. The Problem as Immutable

On the basis of the above it is further assumed, third, that *problem definition and analysis precede solution attempts*, i.e. that the nature the design problem(s) to be solved are understood and articulated *prior to* the search for solution strategies, and thus that, while solution strategies and solution-candidates may change during the process of problem-solving, in essence *the problem itself does not*.

### D. Designer / Problem / Brief

Two further assumptions suggest, fourth, that within this problem solving-process the problem is *contained in and defined by the brief and its list of requirements*, and, more significantly, that it is *this problem that the designer solves*; and fifth, that the designer is *neutral in respect of the brief*, and thus – and again more significantly – *neutral in respect*

*of the solution(s) offered* in response to the problems posed by the brief.

While each of these five assumptions is in need of further elaboration, attention here must necessarily be directed to the last four. Grave doubts concerning the veracity and usefulness of the 'design=problem-solving' model notwithstanding, this common language frame will be accepted *pro tem* not only on the basis that a much fuller analysis would be required to establish its shortcomings and to propose an alternative, but also because retaining the nomenclature of 'problem' and 'solution' facilitates the demonstration that conventional design thinking has most usually misunderstood both *the nature, context and source(s) of the actual problems that designers solve*, and *the relations between such problems and the solutions that designers advance*.

## I. STARTING WITH PROBLEMS?

As noted above, the view that the range of activities or tasks that inhere within design constitutes a problem-solving process usually commits its adherents not only to the further (and presumably self-evident) assumption that the act of design is initiated by and predicated on problems, but that such problems are *externally generated*, i.e. "…presented *to* the designer *by* some outside agency as part of a brief or specification of wants and needs in relation to a particular project. Such specifications of requirements will vary in detail, complexity and content, depending on the individual project, but the designer's task, and thus the designer's expertise and skill, is to solve the problem thus presented" (Harfield 2007: 161).

### A. On 'Outsideness'

Such recourse to an external agency tempts us into the belief that such problems lie *'outside' the designer*. Such 'outsideness' may be construed in two distinct but mutually reinforcing ways. First, the received view that the brief articulates a set of factual and pragmatic requirements or needs that are *given to not generated by* the designer, that lie outside the will or control of the designer, and that define and establish the nature of the design problem that the designer is expected to 'solve', supports the dual inferences that the design problem *itself* is thus given to, not constituted by, the designer, and that the 'givens' of the design problem are objective in respect of the designer. Second, and from a professional perspective, there is a tendency to ascribe to the designer a supposed neutrality or impartiality in respect of the problem. This is not to imply a lack of engagement on the designer's part, but rather to frame and circumscribe the relation between the designer and the design problem: the designer is an expert who solves design problems on the basis of careful analysis of the problem requirements.

### B. Professional Augmentation

This is also not to suggest that the designer has no input into the formulation of the problem. Indeed, it is well understood, not least by the client, that the initial list of requirements provided in the brief is far from complete and must be augmented by a range of additional information that is expected to fall within the professional expertise of the designer and be provided by the designer as a normal part of the design process. This leads to the belief that, given the professional nature of the advice, the further elaboration and articulation of the design problem that such augmentation and modification provides remains objectively-based and thus 'outside' the designer. The design problem itself, even in its augmented form, is thus still given to, not constituted by, the designer. It is this augmented brief that I identify as the 'problem-as-given' (Harfield, 1999, 2002, 2007).

Uncontroversial in itself, this descriptor illuminates two widely accepted yet ultimately unsound assumptions, first, that it is *this* problem that the designer solves, and, second, that, although the future design solution is necessarily a mediated solution, it is mediated solely by the application to the problem of the professional knowledge and skills of the designer, i.e. by the application to the problem of a rational and quasi-objective analysis, and not by any personal preferences and desires on her/his part.

### C. Which Problem? Whose Problem?

The suggestion that these assumptions are unsound is based on two assertions: first, that, while comprehensible as a legitimate starting point for the design process, the problem-as-given is *not* the problem that the designer eventually solves; and second, that both the analyses of such problems, and the solutions which flow from such analyses, are always informed by and significantly structured by personal design preferences and positions already held, consciously or otherwise, by individual designers.

## II. ON PROBLEMATIZATION

In order to examine the significance of such designer preferences and positions it is necessary to rehearse two common 'givens' concerning the nature of design problems and design outcomes. The first of these is that the same brief – and thus ostensibly *the same design problem* – allows for *a variety of different solutions*. Rather than being all-or-none solutions that can be assessed as being either right or wrong, design solutions are taken to epitomize satisficing or 'better-or-worse' solutions, i.e. solutions that are assessed according the extent to which they satisfy some set of predetermined criteria. Such criteria are usually taken to be the requirements established in the problem-as-given, and are thus taken to be *the same for each designer*.

The second 'given' parallels this, asserting that individual designers inevitably exhibit differences in professional experience, skill sets, talent and creativity (howsoever the latter two are defined), and that it is on this basis that *different designers produce different design solutions from the same design problem*. Architectural design competitions and the work of architecture students in studio situations are taken to be compelling evidence of both these assumptions.

### A. Forewarned, Forearmed?

Yet while both multiple solutions and varying levels of experience, skill and creativity can be taken as read, the 'same problem scenario' (Harfield 2002, 2007) is not so easily accepted. Thinking again of the architectural design competition (although the assertion applies to any and every

designer's interaction with any and every design brief) we might note that designers arrive at the problem – and, more significantly, cannot help so arriving – armed not only with the requisite professional skills and knowledge needed to solve the problem but also with particular and individual and often conflicting views about the nature of design itself; about how problems should be solved; about what would constitute not only *appropriate* solutions but appropriately *'designerly'* solutions, both generically and in detail; and thus about what would constitute *appropriately designerly problems* (Harfield 2007: 164). In other words, designers are not objective and neutral in respect of design problems. They do act from personal self-interest. For each designer each design is 'their' design, a personal exploration and statement that not only serves the clients' or users' interests, but does so *in a way that reflects the designing mind and designing personality that produces that outcome*.

Design problems are thus not just 'received' by the designer in the form of a set of extant and fixed requirements, nor are such problems merely augmented by the designer on the basis of professional expertise, to establish the problem-as-given. Rather, the collective requirements of the problem-as-given are synthesized and internalized by the designer, and are further augmented, incorporated and subsumed into a more specific and targeted and personal entity that I have dubbed the '*problem-as-design-goal*' (Harfield 2002, 2007). The form and content of each design outcome is thus based not on answering the question 'how have you elected to solve the problem-as-given?' but rather on determining 'on the basis of the problem-as-given, *what further and designer-specific problem has been generated and selected for solution?*'

The problem-as-design-goal thus constitutes *the individual designer's overlay on the brief that determines what she or he wants to do with the general problem presented*. This personal decision is not concerned with professional issues of how to solve the problem established by the requirements in the brief, but rather, and in addition to those requirements, to the question 'what is the architectural or design problem that I as designer choose to adopt and solve?' Such 'problematization', different for each designer and for each project, is central to design and will inform and constrain both the design activity and the final outcome *in ways that are not dictated by the brief itself*. Moreover, it explains *not* why different designers produce different solutions to what is ostensibly the same problem, but how, from the same initial givens, or, more generally, *from any set of initial givens*, inevitably and inescapably, *each designer constructs a different problem*. Knowingly or unknowingly, each designer brings to bear on the problem as given a viewpoint or a position, a set of formal and aesthetic and technical sensibilities, based on prior experiences and preferences and prejudices, which determine not only how the problem at hand will be solved, as if it is somehow neutrally presented for the most efficacious solution, but just what problem the designer will choose to solve. In important ways, then, *designers construct the problems that they seek to solve*. On this basis, an architectural design competition will elicit *not* (as is often claimed) 'fifty different solutions to the

same problem'. Rather, and despite being based on the same initial brief, the submissions represent *individual solutions to fifty different problems*.

## III. IMPOSING 'SELF' ON 'PROBLEM'

This imposition of 'self' onto 'problem' suggests a number of further considerations relevant to design and design education. In unpacking such considerations we should return briefly to another 'given' of design thinking, the 'ill-structuredness' of design problems. Under this analysis, and drawing parallels most directly from the work of Simon (1973; 1977), design problem-solving is open-ended: no definitive design solution can be reached; a variety of distinctly different outcomes are possible depending on the specific inputs; there is no algorithm for generating solutions; and there is no formalized way of knowing when to stop the process of solution-finding. While this is taken as read, an alternative descriptor of such lack of structure – 'wicked', utilized by Rittel & Webber (1973) among others – adds the caveat that "a design problem and its solution are linked in such a way that *in order to think about the problem the designer has to commit themselves to some sort of solution*" (Lloyd and Scott (1994, my emphasis).

This early commitment to what I will call a *proto-solution* raises a number of issues that can only be enumerated here.

### A. Position Precedes Solution

First, this proto-solution is not just *any* solution, used as a convenient test case; nor, I would suggest, is it a solution derived by apparent deduction from analysis of the problem as given. Rather, it is a trial or conceptual solution, based on the personal preferences and ideological position of the individual designer.

### B. On 'Invisibility'

Second, while it is contended that the ideological and theoretical commitments that assist, lead and control the designer are central to what we might call 'design action', this is *not* to suggest that they are necessarily *conscious to the designer*. Just as in everyday life, many of our beliefs, our preferences, our prejudices, and thus our ways of seeing the world, are so inherently 'taken for granted' – the 'normalized' and 'naturalized' effortlessly presenting themselves as the self-evidently normal and natural – that they remain entirely unconscious or, at the very least, under-analyzed and insufficiently reflected upon, despite their undeniable effect(s). Selection of the design concept, the architectural language in which it is couched, and the formal and aesthetic imperatives that flow from it, are therefore not necessarily deliberate.

### C. Constructing the Problem

Third, it should *not* be assumed – as it so often is – that the purpose of this proto-solution is merely to effect a means of comparison between a prospective goal state and the *original problem state*, i.e. that the proposal of a proto-solution is intended simply to establish a convenient feedback loop whereby the problem-as-given can be increasingly better

understood, such that, through this enhanced understanding, the proto-solution can progressively be developed to a more refined final solution. While such ongoing development and refinement of proto-solutions is not denied, the key contention here is that it is *no longer the problem-as-given that is being 'solved'*, but rather a 'new' and more precisely targeted problem, one that is further augmented and articulated as a result of the intense interaction between individual designer and initial problem state, and one which thus reflects the designer's specific intentions and desires. By these means, and recognizing but neither ignoring nor willfully deforming the initial client requirements, the individual designer transmutes the base metal of the problem-as-given into the gold of the problem-as-design-goal.

### D. Problem and Solution as Co-Extensive

Fourth, while this assertion supports the view that design problems and design solutions are co-evolutionary (Dorst 2003; Dorst & Cross 2001), i.e. that they are mutually interactive and mutually informative, such that the problem continues to be refined and formulated in response to ongoing ideas for potential solutions, it suggests more then this. Design problems and design solutions are, or, more accurately, *become* what I will call *co-extensive*: they form a congruent whole whereby the proto-solution and *its* list of designerly requirements *becomes* the problem, or rather, the first in a series of problems. This phrase – *the solution becomes the problem* – suggests that the ongoing and changing requirements of the problem are *the same* as the ongoing and changing requirements of the solution, and indicates that the answer to the question 'what will make me, as a designer, satisfied with the 'solution' I am now working towards?' has already been incorporated into the design process as *requirements and criteria specified in the new and evolving problem*. The reconceptualization of the problem in this way thus both *defines and circumscribes the range and nature of solution possibilities open to the designer*.

### E. 'Informing' the Client

Fifth, this issue of criteria is of further significance insofar as it impinges not only upon the designer but also upon the *client*. While it is clear that clients do aim to end up with an outcome that is, for them, particular and unique and that meets certain pre-established briefing requirements – i.e. they have 'something' in mind at the beginning of the process, along with certain criteria that will be used to assess this potential 'something' – it should be similarly clear not only that the precise nature of the final design outcome cannot be specified in advance of its accomplishment, but that *neither can the 'final' problem statement, the final list of desirable requirements, nor the final outcome criteria*. Regardless of the starting point, all necessarily remain in a state of flux, with *additional and different requirements and criteria developing in parallel with and in response to the emerging solution*. In this way both the designer *and the client* come to understand what it is they 'want' as an outcome of the generation of potential solutions that illustrate and illuminate such 'wants', and thus that *generate criteria and*

*requirements that were not part of the original problem-as-given*.

## IV. CONCLUSION: FROM THEORY TO EDUCATION

In concluding, we should return briefly to the issue of the ideological commitments that drive design thinking. From a design perspective, the unavoidability, to say nothing of the desirability, of personal projection of self onto problem must be recognized at the outset. Each designer approaches design tasks forearmed with a plethora of likes and needs, assumptions and beliefs, preferences, prejudices and biases, knowledge, skills and understandings, all of which both affect and effect the ways, means and sensibilities with which s/he engages with design tasks. Moreover, all of the above will determine, in advance, not only what will be regarded as satisfactory outcomes but what will be deemed as appropriately interesting, significant, and/or fertile problems. Each individual designer, it is contended, therefore brings to bear on the understanding of the problem-as-given a set of views that condition how, for that designer, that problem will be transmuted and operationalized into a design goal.

If these propositions are accepted, then they not only shed light on the nature of design thinking and design problem-solving but also suggest at least five significant implications for design education:

(1) it is essential as part of the educational process that students/designers are made aware of the influences and inputs – sometimes well-known, oft times unconscious – that circumscribe and control, define and limit, their design thinking and thus their design practice;

(2) this suggests that the conventional, simpler (and, it might be suggested, naïve) model of design as a rational and, the implication is, quasi-neutral problem-solving process wherein intelligent and rigorous analysis of a predetermined design brief or design scenario is not merely the first step in, but is sufficient in itself for, the derivation of an acceptable and informed design solution, must be severely re-examined and significantly reconceptualized by educators;

(3) this in turn suggests that students need explicitly to be made aware that often-less-than-rational inputs condition the design process generally; and,

(4) that the imposition of self onto problem implies not merely a personal and deliberate involvement on the part of the designer, but reifies an essentially unconscious, or at least substantially unrecognized, world, suggesting that key aspects of each individual's input into her/his design process are (a) preconceived, (b) un- (or at least, under-) examined, and (c) ideologically driven;

(5) the same, of course, can be said of the educator, such that we might warn that the pedagogical 'problem setter' and 'solution assessor' him/herself is similarly beset by predetermined views and commitments which can significantly affect what problems are set and how the solutions of student designers are received and assessed, i.e. design educators set problems but often fail to recognize their own assumptive expectations, and do not 'renormalize' to each student's personal determination of 'their problem'.

Design *education* is thus inescapably tied to design *expectations*, and, insofar as we are able, it is therefore a

primary responsibility of design educators to drag into full consciousness the largely unconscious world of preference, prejudice, belief and assumption upon which the design process is predicated.

REFERENCES

Dorst, K. 2003. The problem of design problems, in N Cross & E Edmonds (eds) *Proceedings of the 6th Design Thinking Research Symposium: Expertise in Design, University of Technology Sydney, 17-19 Nov 2003*: 135-47.

Dorst, K. & Cross, N. 2001. Creativity in the design process: co-evolution of problem-solution. *Design Studies* 22, 5: 425-37.

Harfield, S.J. 1999. The lure of the Sirens' song: part 1, first thoughts on process. *Journal of Architectural Education* 52, 3: 174-88.

Harfield, S.J. 2002. How buildings come to be the way they are, in R Best & G DeValence (eds) *Building in value: design and construction*. Oxford: Butterworth Heinemann: 17-32.

Harfield, S.J. 2007. On design 'problematization': Theorising differences in designed outcomes. *Design Studies* 28, 2: 159-73

Lloyd, P. & Scott, P. 1994. Discovering the design problem. *Design Studies* 15, 2: 125-40.

Rittel, H.W.J. & Webber, M.M. 1973. Dilemmas in a general theory of planning. *Policy Sciences* 4: 155-69.

Simon, H.A. 1973. The structure of ill-structured problems. *Artificial Intelligence* 4: 181-200.

Simon, H.A. 1977. *Models of Discovery*. Dordrecht: Reidel.