Design as intentional action: a conceptual analysis

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Drawing on methods and literature from the field of philosophy, an account is given of the general nature of the artefact production process in order to provide a conceptual platform for design research. Designing is itself defined as the production of design representations; and the latter notion is analysed in the context of the artefact production process. The analysis is conducted in such a way as to keep the assumptions on which it is based explicit, plausible, and acceptable to common sense. The ‘obvious’ view of design representations as descriptions of possible or future things is rejected, and so the major philosophical difficulty is to propose a reasonably precise definition of ‘design representation’ without implying the existence of such non-existent things. To overcome that difficulty, a definition is developed in terms of human agents, their actions and ideas (including intentions). The paper closes with a summary of the assumptions made. © 1998 Elsevier Science Ltd. All rights reserved

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lack a ‘simplifying paradigm’ of *designing*. I shall propose in this paper such a ‘simplifying paradigm’, exploring the basic idea that designing is not only thinking but also *acting*. Rather than seeing designing as problem solving, decision making, etc, I attempt to see designing as part of a more comprehensive process of artefact production, a process which is constituted by a sequence of human actions intended to include eventually the production and approval of an artefact.

An artefact production process relies on designing when it includes the production of a *design representation*; indeed, I propose to define designing itself as the production of a design representation.

Whatever value may be attributed to this definition it must acquire from an analysis of the notion of design representation, and of its context, the artefact production process. In this paper I offer such an analysis, thereby hoping to provide a firm (and even play-) ground on which one may play such games as investigating the nature of design thinking and knowledge; or of specific design representations, of design cooperation and communication, of design education, or computer support for designing. In short, the purpose of this study is to facilitate further studies (be they theoretical or practical, descriptive or prescriptive) of various aspects of artefact production and designing.

As explained in the next section, such development of a ‘simplifying paradigm’ of designing is an exercise in what may be called ‘the philosophy of design’. It is not surprising, therefore, that the initial analysis of the artefact production process, in section 2, confronts us with a problem of a philosophical nature, ‘the problem of the absent artefact’, with which we shall deal in section 3. A solution in which the notion of the designer’s *intentions* plays a crucial role will be developed in section 4, leading to a ‘technical’ definition of the notion of design representation, hence of the notion of designing. The solution proposed will be elaborated at the end of section 4, primarily by extending the view of the artefact production process so as to comprise the *use* of artefacts as well, thereby throwing more light on the preceding analysis. In section 5 the discussion is rounded off by briefly considering the general philosophical position to which the analysis of designing in terms of design representations, and ultimately in terms of human actions and intentions, has led us.

**I Method of inquiry and related work in philosophy**

Although the results of the present study are hoped to serve as a conceptual foundation for empirical investigations of design and development of computerized design technology, our present subject matter is not a technical
or scientific problem to be investigated by the familiar empirical methods of design research as listed by Cross¹ (pp 3–4): interviews with designers, observations and case studies, protocol studies, controlled psychological tests, or artificial intelligence simulation of design behaviour. It is amenable only to what Cross includes at the end of his list as ‘reflection and theorizing’. Given the generality of the question on which I shall reflect and theorize, viz. ‘what is the nature of designing?’, it is evident that I shall be moving into the field of philosophical inquiry.

Once this has been acknowledged, we should also realize that no final consensus is likely ever to be reached on whatever answers the inquiry might come up with; for philosophy is neither science nor technology but rather a never-ending cultivation of competing ideas and arguments². And yet asking philosophical questions about the very foundations of design research, and attempting to answer them, need not be futile speculation. Design research can hardly be conducted without tacitly or explicitly presupposing some general understanding of what designing is, and such an understanding rests, I believe, on philosophical assumptions. And at least in research it is better, I contend, to be aware of one’s basic assumptions than to remain unaware of them.

What we should aim at, then, when philosophizing about design, is a coherent and intuitively plausible explanation of it in terms of explicit assumptions about the general nature of other aspects of the world; say, human beings and their actions. The weaker and less controversial we can make our underlying assumptions (i.e. the lesser the degree to which we must ‘commit’ ourselves), the more successful we may consider our efforts.

Apparently designing as a subject of study has not attracted many philosophers. To my knowledge, the philosophers whose work most directly bears on design research are Risto Hilpinen and Randall Dipert. Hilpinen has studied the nature of artefacts, primarily material ones defined as ‘physical objects which have been manufactured for a certain purpose or intentionally modified for a certain purpose’³. He not only analyses the notion of artefact itself (the physical object once it has been produced) but also the relations it bears to the person or persons who made it⁴; and, in some cases, to a work of art created by means of the artefact (e.g. the relation between a novel and its manuscript)⁵. In particular he clarifies such relations in cases where a work may have several instances (a topic ignored in the present paper, but of relevance to much industrial design, for example). Of particular interest to research in computer-supported designing is his more recent analysis of information systems (in the abstract sense of ‘sets of propositions used for storing information for a certain purpose’)

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3 Hilpinen, R ‘On artifacts and works of art’ Theoria Vol 58 (1992) pp 58–82
which he subsumes under his notion of artefact\textsuperscript{5}. Although there are points of contact to the analysis attempted in the present paper,\textsuperscript{6} Hilpinen’s results do not save us the hard work of our present project, whose focus is on the process of artefact production (in particular the part of it we call designing), rather than on the artefact itself.

Similar remarks apply to Dipert’s work. In a monumental book\textsuperscript{6} he develops a notion of artefact that includes not only material ones, but also ‘certain types of intentional events (e.g. utterances and performances)’ (p 11). To do so he explores the nature of human agency and intention. He distinguishes various types of artefacts, such as ‘communicative’, ‘expressive’, and ‘practical’ ones and develops a theory of evaluation for artefacts (in what respects can they succeed or fail?). The utility of his theory is then demonstrated by applying it to art works, and the book closes by contrasting what is artificial (including artefacts) from what is natural. Thus Dipert manages to study ‘almost everything’ in the book—except as he points out himself (pp 1–2), persons and their mental contents which are dealt with only indirectly.

Nelson Goodman has theorized at length over the nature of art and the symbol systems of which it makes use, and Peter van Inwagen and others have had a good deal to say about the ontological status of artefacts. As with Hilpinen and Dipert, I shall refer to the writings of these authors where I am aware of my argument coming into contact with their work. As will also be suggested in passing (explicitly or by further occasional references), the analysis to be presented has ramifications that could be pursued into more densely populated regions of philosophy.

2 The artefact production process: initial analysis

Let us see how designing might be understood in terms of human actions. The actions involved in the artefact production process, we assume, are typically performed by three \textit{agents}: a client, a designer, and a ‘maker’. At one extreme, the agents may be just three individuals. To keep abstraction at arm’s length for a while, let us visualize them as the school teacher next door who wants a weekend cottage constructed on an attractive site he has just purchased, the local architect running a one-man design practice, and his friend, a retired carpenter, who agrees to build the cottage on favourable conditions, provided he is allowed to do it at his own pace. At the other extreme, each agent may be a large professional organization involving hundreds of cooperating individuals with a variety of legal, financial, artistic, and technical specialities. Accounting for the processes of cooperation inside such an organization is a task of considerable interest and complexity, but irrelevant to our present discussion. No doubt a more

\textsuperscript{5} Hilpinen, R ‘Belief systems as artifacts’ \textit{The Monist} Vol 78 (1995) pp 136–155

\textsuperscript{6} Dipert, R R \textit{Artifacts, art works, and agency} Temple University Press, Philadelphia (1993)
The reader may find the 'generic' process under discussion somewhat biased towards architectural design and the production of buildings. No doubt my original background in architecture still influences my way of thinking, but I trust the results of the present analysis are sufficiently general to be applied to other fields as well, possibly after minor adaptations.

†Dipert makes a similar distinction of what he calls the passive from the active direction of world–mind interaction (pp 8–11). The former, he notes, has received 'vast attention' among philosophers, whereas the latter has been almost completely ignored. It is high time, he argues, that philosophers move on to consider intention (p 42) and 'human action and with it the ubiquitous intentional products of that action, artifacts' (p 11). I would suggest that designing be added to the agenda, since it is intimately connected with the production of artefacts.

Each action is located in time. Even though it may have a certain duration, let us say, to keep matters simple, that it is located at a single point in time, viz. the point at which it terminates. Formally, an action of production (action of type 1, 4, or 8) may then be taken as a triple of agent, thing, and (termination) time, and the type itself as a relation: a set of such triples. An action of interpretation (action of type 2, 3, 5, 7, 9, 10, or 11) is formally a triple of thing, agent, and (termination) time, and again the type is a set of such triples, a relation.

A minimal artefact production process would be a set of just 11 actions, one of each of the 11 types, performed in the order (with respect to termination time) indicated by their number. Step by step, then, the minimal process runs as follows. First, the client produces a brief (action of type...
1. Once he* has interpreted it as being adequate (action of type 2), he hands it over to the designer. To initiate designing, the designer interprets the brief (action of type 3), then proceeds by his producing a design representation (designing as defined above), usually consisting of several sketches, drawings, descriptions, computer files, etc (action of type 4), interpreting it as adequate (action of type 5), and submitting it to the client for approval. When the client has interpreted the representation (action of type 6) and communicated his approval to the designer (not shown in the diagram), the designer delegates further work to the maker by handing over the design representation to him. The maker, in turn, interprets the representation (action of type 7) and produces the artefact (action of type 8), interprets it as adequate (action of type 9), and submits it for approval by the designer who interprets it (action of type 10) and communicates his approval (not shown) to the maker. In the same way, presumably, the client will interpret (action of type 11) and approve the final artefact. (In section 4.2 I shall consider the user of the artefact as a fourth agent; we can do without him for a while, however, for he is not essential to our present effort at exploring the nature of designing.)

In practice many of the actions described above will have to be reiterated, such that for a given artefact production process, each of the 11 action types may have several instances. For example, the client may not be satisfied with the brief as originally drafted, and so he modifies it; the design representation will usually have to undergo a long series of modifications with occasional consultation of the client; the brief may even be changed as the design representation evolves because the client realizes some of his goals were unattainable, or that he had goals of which he was not aware initially; the artefact may (and almost certainly will) be submitted for intermediate approval before it is completed, and so forth.

In general, therefore, an artefact production process can be formally characterized as a set of actions of the 11 types, containing a minimal artefact production process as a subset. (Partial processes might be characterized analogously, in terms of the first \( n \) action types, for some \( n \) less than 11.)

2.1 The use of representations

The kind of artefact production process I have outlined comprises not only designing but also the context in which it occurs and with which it is intimately connected: the actions of the client and the maker. Let us now focus on designing itself, defined as the production of a design representation. To understand designing we should understand the roles played by the design representation.

*My use of 'he', 'his', 'himself', etc, in such contexts is not intended to suggest any particular sex of the person referred to, nor indeed to dispute contemporary notions of sex equality. For lack of gender-neutral personal pronouns, however, I insist on using the male ones rather than the politically correct but stylistically intolerable phrases 'he or she', 'himself or herself' etc. (If women authors would insist on using 'she', 'her', etc, in the same way, I should think it only fair.)

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It is a gross simplification, of course, to talk of ‘the design representation’. For any non-trivial design project it will consist of many different (sets of) documents, models, or computer files, and the client and the maker are likely to receive different ones (for example, presentation drawings and 3D models for the client; technical construction drawings and verbal instructions for the maker), and the informal sketches used by the designer will often be of a private nature and never enter into communication with others. For the purpose of our present abstract analysis, however, we can regard the entire collection of documents, etc, that a designer produces in the course of a project (the ‘project file’) as a single entity, the design representation, ignoring distinctions between its individual constituents, and disregarding the fact that different agents see different portions of it.

A design representation plays essentially two roles: it is a means of communication, and it is a vehicle for exploration.

First, the representation is a means of self-communication for the designer (by actions of types 4 and 5). The designer produces a design representation and studies it to satisfy himself that it is adequate, which usually leads to a series of revisions. If the designer is concerned with the design of a building or another complex artefact, such self-communication is necessary because it is impossible to focus one’s attention on all aspects of the intended artefact at once. Studying the representation allows the designer to shift his attention from one aspect to another without effort, simply by inspecting one portion of the representation after another. When eventually the artefact is presented to the designer for approval, which may be months or years later, he may need the representation to remind himself of his intentions, in order to be able to assess the actual artefact. Much earlier, however, the designer engages in communication with the client (action of type 6) and the maker (action of type 7), who thereby come to know (something about) what the designer intends, and, apart from that, will probably use the representation in similar ways for focusing on various aspects one at a time.

When used for exploration, the representation is used to answer a variety of hypothetical questions which may be posed by the client and the maker as well as the designer. For example, a perspective drawing, a cardboard model, or computerized replacements for such traditional representations, may answer their questions about the visual appearance of the intended artefact: ‘What would it look like (when viewed from this point, when walked through along this path, etc) had it been constructed according to the current proposal?’ Similarly, a bill of quantities is used for cost estimations: ‘How much would it cost to construct this thing?’, ‘How much
time and labour would it take?’. A detailed representation of a beam, say, may help the maker predict its response to the expected load: ‘What would its deflection be if we place it here and let it carry half the load from these floor slabs?’—and so forth. Exploration, in short, is a way of obtaining further knowledge about the intended artefact; of probing into the consequences of tentative decisions about it, thereby providing a basis for rejection or approval of such decisions (using perhaps such forms of reasoning as I recently investigated elsewhere8–12).

Herbert7 offers a more fine-grained and very readable analysis of the use of design representations (in architectural design), focusing on what I have called self-communication and exploration by means of informal sketches. To some degree his analysis is compatible with the ideas put forward here, but there are divergencies as will become clear from section 3.1.

2.2 Degenerate cases of artefact production

Despite their central position in the artefact production process, design representations and designing cannot be granted the honour of sine qua non of artefact production.* Rather, they are used for practical reasons of managing complexity. Complexity of the intended artefact may be sufficient reason to employ some kind of representation in the designer’s self-communication, as discussed above. Complexity of the total organization of cooperating agents may be sufficient reason for using representations in interpersonal communication. The three-person ‘organization’ we consider already needs representations for communication, and client, designer, and maker agents comprising several persons will need in addition intermediate representations for their internal communication. For example, a design firm employing architects and engineers may use preliminary architectural drawings to provide a basis for early structural feasibility assessments. A ‘maker’ organization such as a consortium of contractors may comprise several production planners and subcontractors who add further detail to an architect’s working drawings in order to plan excavations, temporary on-site facilities, labour deployment, materials delivery and storage, etc.†

Still, in the absence of complexity of artefact and organization, design representations and designing can be dispensed with. They are not, therefore, essential to artefact production in general, though usually employed. In Figure 2(a), designer and maker have merged into one, communicating with the client only through brief and final artefact. A situation of this kind might be that of a man (the client) asking a plumber (combined designer and maker) to renovate his bathroom in such-and-such a way, explained face-to-face in conversation and by pointing and gesturing.‡ Another example would be the customer asking a skilled potter to design and make...
a large monumental vase to adorn his entrance hall. The even simpler situation shown in Figure 2(b) might be exemplified by the do-it-yourself enthusiast paving his garden path with irregular flagstones,* by someone arranging flowers in a vase, or by the child constructing Batman’s home base from Lego blocks. In all of these cases an artefact is produced which, it would seem, is based on some sort of planning, but without any use of design representations—unless, of course, we choose under such circumstances to regard the artefact itself as a (special kind of) design representation.

Furthermore, in cultures where production of artefacts of the built environment is based on a strong tradition, and innovation is reduced to correction of obvious malfunctions of the artefacts, the production of artefacts is also likely to proceed along the lines of Figure 2(a) or Figure 2(b). Specialists are not needed: everyone can criticize a form that does not work; it only takes a design specialist to invent a form from scratch. Christopher Alexander vividly described the transition from tradition-based to consciously innovative designing in chapters 4 and 5 of Notes on the Synthesis of Form13. He felt the built environment of modern society was poorly conceived and poorly adapted to its context and the needs of users, and blamed this on precisely the specialization of agents and the self-conscious efforts that specialists make at designing from scratch. Although his criticism may be as much to the point today as when he published it more than 30 years ago, we shall not pursue the matter any further here, but concentrate on the way artefacts are usually produced in a modern society without dominance of tradition, as schematically described by our diagram in Figure 1.

3 The problem of the absent artefact

We have seen how a design representation is used in the (typical) artefact production process: it is something a designer produces and uses for communication with himself, with his client and with the maker; and it is something by means of which the three of them can acquire knowledge.
about the artefact, as it were, before it has been produced. But if we ask the seemingly innocent question ‘what is the design representation itself?’, our analysis so far is of little help.

Suppose, for example, that an architect has made a set of reasonably detailed but still tentative plans and sketches of a house and wants to discuss them with the client. We can agree, presumably, that the plans and sketches are design representations; and the way we talk about them, using such phrases as ‘plans and sketches of a house’ certainly suggest that they are descriptions or pictures of an artefact. But what artefact? At the design stage of the overall artefact production process (the stage where design representations are produced), the ‘artefact’ is absent; it is something we intend to produce but which is not yet at hand. The architect may truthfully tell his client that ‘the house’ he is designing complies with the fire safety regulations, even though there is not yet any house at hand to comply with anything. Obviously, he is not therefore talking nonsense. But conceivably he is using language in much the same way an author does when writing fiction.

It is, on reflection, a curious property of human language and other forms of expression that, in a sense, they allow us to talk elaborately about things or persons which do not exist, and to picture them in great detail. Accounting for this phenomenon has been acknowledged by many philosophers as a challenge. Verbal or other discourse that purports to be ‘about’ real material entities while in fact there are no such entities (yet), is obviously essential to creativity in design and artefact production, but how is it possible? How can we (apparently) utter and communicate truths about things which are not there to make our propositions true? These questions, when asked of design representations, state what I shall call the problem of the absent artefact.

To explain what a design representation is, we must find a satisfactory solution to that problem. I shall consider two basically different approaches.* One is to trust our linguistic intuition which suggests that since we talk about design representations as ‘plans and sketches of a house’ and the like, design representations must somehow be descriptions of artefacts. The difficulty with this approach lies in explaining how, or in what sense, one can describe or depict a non-existent thing.

The other approach is to distrust linguistic intuition and maintain instead that what design representations ‘really’ describe or express (and what accounts for the truth of propositions expressed or implied by them) is not an as-yet-non-existent artefact of the material world, but rather an entity

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*Other approaches could probably be developed by applying some of the general theories of reference proposed in the volume just cited to our more specific problem of the absent artefact. That is beyond the scope of the present paper, however.

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14 Haller, R (ed) Non-existence and predication (Grazer philosophische Studien 25/26) Rodopi, Amsterdam (1986)
belonging to a mental or cognitive realm and existing there when we
describe or express it; let us call it an idea, for short. If we could explain
how an artefact is eventually produced in accordance with such an idea
that foreshadows it, we should have escaped the problem of the absent
artefact. However, on the assumption that in some sense an architect can
truthfully state that his as-yet-non-existent ‘house’ satisfies the fire safety
regulations, this second approach seems to imply, somewhat puzzlingly,
that what ‘really’ complies with the regulations is an idea of a building,
rather than a building! More generally, what makes a proposition true or
false would be an idea rather than a thing; a cognitive rather than a non-
cognitive entity.

At least as an attempt to dodge such trouble, serious consideration of the
first approach seems worthwhile. Let us proceed, therefore, by reviewing
a few items of literature pertaining to the problem of the absent artefact,
mainly with the first approach in mind. We shall return to the second
approach in section 4 (and face the trouble in section 5).

3.1 Herbert’s attempted escape from the problem

Herbert observes that architectural ‘context drawings’ (i.e. sketches which
summarize the design decisions so far made) ‘appear to be straightforward
graphic representations of a whole or part of a building?’ (p 109), but he
is aware of the problem of the absent artefact lurking behind the surface:
‘Can we re-present something that does not yet exist?’ (p 7, his emphasis
and hyphen); ‘At the time a context study drawing is made no building
exists for it to match’ (p 110).

He considers, and immediately rejects, four candidate entities for the draw-
ing to match (p 112). (1) ‘The eventual building?’ Rejected because the
outcome of the designer’s decision making is uncertain; no eventual build-
ing has yet been determined. (2) ‘The class of buildings that might be
developed from the drawing?’ Rejected for similar reasons; there may be
infinitely many such buildings. (3) ‘A mental image?’ Rejected because
the designer’s mental images are neither clear nor complete enough. (4)
Finally, the proposal that the drawing might match itself is rejected as an
absurd and desperate move.

This leads Herbert to abandon the idea that a drawing must match some-
thing and to propose instead ‘two representational roles [for a “context
drawing”] that do not involve matching: holding information in place and
managing change’ (emphasis added). The change in question is understood
to be change of (the information held in place by) the context drawing.
Such change is induced, according to Herbert, by means of ‘exploration
drawings’: typically small sketches scribbled in the margin of a context

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"Note on the issue of ambiguity: Herbert summarizes his central thesis as follows: ‘the role of study drawings [designer’s sketches] is one not of passive recording but of active participation in formulating the design’ (p 2). The sense in which Herbert describes drawings as ‘active’ has to do with the ability of the architect to ‘read more out of a mark or a drawing than went into it; to generate information’ (p 84; see also p 3 and chapter 7).

Herbert puts this down to what he calls the ‘ambiguity’ of a sketch (p 3), its ‘possibility of multiple interpretations’ (p 84), and the ability of an exploration drawing to ‘mean whatever the designer intends it to mean’ (p 114). Admittedly, a sketch may be ambiguous, thereby leading to a fruitful reinterpretation. But there is no need to assume, as Herbert seems to do, that all or even any substantial amount of new information is generated by reinterpretation of ambiguous sketches (be it accidental or intended). Rather, I would conjecture, as a rule a sketch continues to represent to the designer what he had in mind when drawing it (as long as he leaves it unchanged). But the sketch helps him make inferences from what he had in mind (somewhat

drawing, or on an overlay sheet of tracing paper. In an exploration drawing the designer experiments with a new version of a detail taken from the current context drawing (the driveway taken from a site plan, a meeting room taken from a larger plan layout, the capital taken from an elevation of a column, etc). Herbert holds that it is the inherent ambiguity of a design sketch—in particular an exploration drawing—that enables the designer to read more out of it than went into it, thereby creating new information: ‘The exploration drawing has its own non-matching role: creating change, or producing new meanings’ (p 114). He even goes on to say that ‘it has become so abstract that it is purely a graphic mark’. The new information thus gained is incorporated into a revised context drawing, and this is how the context drawing ‘manages change’ and ‘holds information in place’.

By introducing ‘non-matching roles’ of drawings as summarized above, Herbert seems to think he has escaped the problem of the absent artefact. And yet it remains unexplained what the information ‘held in place’ by the changing context drawing could be information about. To fend off this objection, one might conceivably contend that information need not be about anything, but could merely be used in certain ways (say, for construction of buildings). But Herbert seems disinclined to embark on such a philosophical adventure. (Which, I admit, would be rather risky if the aim is intuitive plausibility and the criterion of success is weakness of the basic assumptions, as I assumed in section 1.) For he explains (on p 112) that the context drawing serves as ‘a kind of graphic index of information about the design’ and that it ‘constitutes the design by holding in place all the information about it’ (my italics). And so our problem persists in disguised form: for what indeed is the design that the information is allegedly about (i.e. which the drawing represents), if not the absent artefact?

3.2 Goodman’s ‘fictive exemplification’

Though not directly concerned with the problem of the absent artefact, Nelson Goodman15 (pp 21) has discussed an analogous problem presented by what we tend to call a ‘picture of Pickwick’ (or a ‘picture representing Pickwick’) and a ‘picture of (representing) a unicorn’. Such pictures represent nothing, according to Goodman, because there is no Pickwick and there are no unicorns. Yet the way we talk about them suggests a relation holding between a picture and Pickwick, and between a picture and a unicorn, as if Pickwick and the unicorn existed on a par with the pictures. This difficulty arises, Goodman says, from the fact that we construe the phrases ‘picture of Pickwick’, etc, as if they named a two-place predicate x is-a-picture-of y that may be satisfied only by pairs of existing entities, e.g. the pair formed by a picture of Churchill and Churchill himself†15 (pp 21f). Instead, he suggests, we should think of the phrases as naming such
as explicitly stating a number of propositions may help us make inferences form them. To take an example differently analysed by Herbert (chapter 5 and elsewhere): sketching the Chapel at Ronchamp as he initially imagined it, Le Corbusier might have seen what he was not aware of before, that if the exterior walls were given the tentatively proposed shape, then they would define an exterior space of an undesirable shape. Such ‘visually inferred’ information is only ‘new’ in the (important) sense that the designer was unaware of it. But it may prompt the designer to make further tentative decisions (say, smoothing the intersection of two walls into a continuous curve as Le Corbusier did in this case). Thus inferred as well as genuinely new information may be produced by the designer without reliance on ambiguity of sketches.

†The Churchill example is due to Goodman. The fact that Churchill is long dead does not affect the relevance of the example, since in logic predicates are usually tenseless.

As noted by Goodman, he uses ‘description’ in a wider sense than that of the technical term ‘definite description’ of formal logic.

Likewise, verbal descriptions may or may not refer to existing entities.* For example, the word ‘desk’ describes (is exemplified by) real things, as opposed to the word ‘unicorn’ (p 31). With a verbal description as well as a picture, there are two questions, Goodman tells us. Question Number One: what it describes or represents, if anything. Question Number Two: what kind of description or picture it is (unicorn-picture, unicorn-description, man-picture, Pickwick-picture, etc). Later (pp 66–67) he holds that predicates describing or being exemplified by nothing may nevertheless be ‘fictively exemplified’. For example, ‘winged horse’ is (fictively) exemplified by Pegasus in the sense that ‘Pegasus’ is a winged-horse predicate. I agree with Goodman that the two questions can be distinguished, but his notion of fictive exemplification looks rather dubious to me, for it seems to boil down to asking Question Number One of one picture or description (‘What does “winged horse” describe?; “What exemplifies “winged horse”?’), and then replying as if one had asked Question Number Two of another picture or description (‘What kind of description is “Pegasus”?’).

In our context of designing, we note that both pictures and verbal descriptions are commonly used as design representations, and as long as they have not been used for the production of an artefact, they are pictures and descriptions that depict and describe nothing, just as Goodman’s unicorn-pictures and his winged-horse description depict and describe nothing. We might say with Goodman that the architect’s sketches and plans of Mrs Foxberry’s new bungalow (to be constructed next year) describe nothing but are nevertheless ‘fictively exemplified’ by, or ‘fictively describing’ an artefact, viz. Mrs Foxberry’s new bungalow, albeit only in the sense that the phrase ‘Mrs Foxberry’s new bungalow’ is (the name of) a bungalow predicate. However, since we should regard fictive exemplification with suspicion, this manoeuvre would do little to rescue the notion of a design representation as a description or picture of an artefact.‡ Besides, it would do nothing at all to explain what it is we communicate through our design representations; and surely one could not communicate without communicating something.§

To cope with descriptions and pictures that denote nothing (such as ‘unicorn’ or a picture of a unicorn, or a painting representing a man but no-one in particular), Risto Hilpinen has suggested an alternative to Goodman’s somewhat artificial one-place predicates as is-a-unicorn-picture, which can be satisfied by pictures whether they represent existing things or not.

Despite my reservations concerning Goodman’s notion of fictive exemplification as described in his book *The Languages of Art*, I would like to point out that the book contains insights of potential value to design theory, notably insights on formal differences among the notations used in music, architecture and other arts.

Admittedly, Carey has suggested that as an alternative to our usual view of communication as transmission of information, one can see it as ritual (pp 15ff). He also briefly outlines a distinction (ascribed by him to Clifford Geertz) between symbols as representations of and representations for reality (p 29; pp 31–32). A blueprint, he says, may be a representation of an existing house (in the straightforward sense); but if no house has been built, it is a representation for reality: ‘under its guid-
a sign $s$: i.e. ‘another sign, a thought or idea’ invoked by $s$ in the mind of a person. For example, the interpretant of a picture of a unicorn may be the linguistic sign ‘unicorn’, whose interpretant in turn may be the phrase (sign) ‘an animal resembling a horse with a horn projecting from its forehead’; or else, HilPINEN adds, ‘the thought (or “idea”) of a unicorn’. What Goodman calls ‘a unicorn-picture’ could thus be called ‘a picture having “unicorn” as its interpretant’. On such an analysis, our architect’s bungalow drawings might be described as, say, ‘a picture having [the linguistic sign] “Mrs Foxberry’s new bungalow” as its interpretant’. But this does not bring us closer to construing the drawings as a (pictorial) description of a building. However, to the extent an interpretant is taken to be a thought or idea rather than a linguistic sign, HilPINEN’s account of the workings of denotationless signs is aligned with the analysis of design representations I shall propose in section 4.

### 3.3 Possibilia and possible worlds

Let us consider another way in which one might defend the view of design representations as descriptions of artefacts. Assuming one cannot literally describe or depict a thing that does not somehow exist, the task is to find a way in which the fictional, unrealized, as-yet-unproduced artefacts in question can be said nevertheless to exist. Doing so amounts, it would seem, to admitting possibilia (possible entities), in one form or another.

More whole-heartedly accepting possibilia, we might assume the reality of possible worlds. A possible world can be explained briefly as one of ‘the infinitely many logically possible states of affairs’ (p 265). The general idea is to identify the state of affairs in the actual world with the actual world itself, and to identify any other logically possible state of affairs with a different world: one existing separately from the actual world inhabited by us. In a very pure form this thesis was advanced by David Lewis under the name of modal realism: ‘there are other worlds, and individuals inhabiting these worlds’ (p viii); ‘absolutely every way that a world could possibly be is a way that some world is’ (p 2). Lewis acknowledges that his ‘denial of common sense opinion is severe’ and admittedly
‘a serious cost’. He argues nevertheless that ‘the theoretical benefits are worth it’, albeit with the proviso, ‘*that they cannot be had for less*’ (p 135, my italics). One of the theoretical benefits to which he appeals is that modal realism facilitates accounting for the nature of properties (see Section 1.5 of Ref 20; see also chapter 1 of Ref 21 or Ref 22).

In all modesty we might adduce, in further support of modal realism, that it offers a solution to our problem of the absent artefact, and a fairly elegant one, at that: Mrs Foxberry’s as-yet-unconstructed new bungalow, although not existing in the actual world, could simply be said to exist, literally, in some other possible world; thus it would make some sense to consider the architect’s representation a description or depiction of the bungalow ‘itself’.

But is that solution worth the cost? I think not. For, as I shall try to show in the next sections, at least with respect to the absent artefact, the theoretical benefits of possible worlds can ‘be had for less’. To posit possible worlds (complete with bungalows and other artefacts), not as mere ideas but as worlds literally existing whether we think of them or not, is to make a very strong assumption indeed which has some rather awkward consequences. (One such world, for example, would be like the actual world except for my having one more hair on my head than I have in the actual world.*) Furthermore, their merits notwithstanding, possible worlds do nothing more to explain what is communicated among designer, client and maker than did Goodman’s fictive exemplification. There is also the problem of explaining how a designer could describe things in possible worlds other than the actual world in which he lives. Finally, one may ask what happens when an artefact is being constructed: is a copy of it introduced into the actual world, or is it just another world (one that always contained the artefact) that becomes actual instead of the one we used to live in? If so, what happens to us: do we cease to exist and become replaced by counterparts in the new actual world, people exactly like us in every respect but not identical to us, or do we somehow travel from one world to another? I do not deny the possibility that reasonable solutions might be proposed to such problems; but I should certainly not like to take the trouble just in order to construe a design representation as a description or depiction of an artefact. So let us give up this latter notion entirely, and look elsewhere for an explanation of what a design representation is.

4 The artefact production process: continued analysis

Turning now to the notion of ideas for help, we adopt what (in the introduction to section 3) was called ‘the second approach’ to the problem of
What I have called ‘ownerless properties’ might be considered an alternative to ideas in this role. Ownerless properties also permit us to escape the problem of the absent artefact, but space limits prevent a discussion of them here.

†If Dretske is right that introspection is not perception of objects internal to the mind but ‘displaced perception’ of mind-external phenomena from which we learn what goes on in the mind (much as looking at the bathroom scale tells us about our weight), then perhaps mental entities are empirically more respectable than they are reputed to be.

‡It might perhaps be argued that certain well-defined formal ideas, like those we find in mathematics, can be faithfully reproduced by other minds than the one in which they originate. But even this seems difficult or impossible to verify or falsify, since ideas, as remarked earlier, can be directly studied only by the absent artefact. I propose to show that ideas (in the sense of states or objects of the mind, or non-material entities accessible through cognition) provide us with the means we need to account plausibly for design representations and communication in artefact production, thereby finally escaping the problem of the absent artefact.* Admittedly, it is not entirely uncontroversial to assume the existence of ideas as mental or cognitive entities in their own right. They cannot be studied by scientifically reliable methods, but only through introspection,† or indirectly in terms of their theoretical usefulness in accounting for observed phenomena and commonplace experience, notably concerning our actions. Yet to me they seem much less controversial than possible worlds, for example, and better suited to our project of accounting for the general nature of designing.

The actions of Figure 1 can now be seen as links in a chain of communication, along which ideas are communicated from one agent to another, or back to the same agent, as illustrated in Figure 3. However, it would be incautious to assume that an idea can somehow be externalized by one agent and subsequently internalized by another agent as the same idea (or a ‘true copy’ of the original idea), for we have no way in which to ascertain sameness or similarity of ideas residing in, or accessed by, different minds.

The augmented diagram of Figure 3 is like Figure 1, except that arrows connect things (brief, design representation, and artefact) with the agents’ ideas, rather than with the agents themselves. As before, a downwards directed arrow indicates a production type of action: the agent whose idea is at the tail of the arrow produces the thing pointed at by the arrow. An upwards directed arrow from a thing to an agent’s idea indicates an interpretation type of action: the agent interprets the thing from which the arrow emanates. Again actions are located in time, and the 11 types may

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*Figure 3 The generic artefact production process illustrated as in Figure 1, but with the agents’ ideas (rather than the agents themselves) connected to material things by production and interpretation. 

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introspection. Schön has argued that basically design ideas cannot be shared. This, however, would seem to imply the assumption of ‘private languages’ which has been contested by Wittgenstein (§§ 243–294; what appears to be his main argument is launched in § 258). Given the controversial nature of the question, I shall stick to my strategy of least commitment (section 1).

*Strictly speaking, there are no fixed relations of production and interpretation once and for all; rather there are evolving collections of actions: collections that acquire new members over time as a result of human activity, or, alternatively, there are sequences of increasingly large production and interpretation relations. This complication could be avoided if (assuming standard tenseless logic) we allowed the relations to accommodate indiscriminately future members (actions) as well as past and present ones. However, by so doing we would expose ourselves to the charge of implicitly assuming possible worlds (or future worlds, which would seem just as uncomfortable).

†Dipert’s notion of *interpretation* of things (chapter 5 and onwards) is somewhat more elaborate than the notion of interpretation proposed here. Dipert’s interpret-

be conceived of as relations: sets of actions.* Now, however, actions are formally quadruples: an action of production is a quadruple of idea, agent, thing and time. An action of interpretation is a quadruple of thing, agent, idea, and time. What was said in connection with Figure 1 about minimal and general artefact production processes, and about the practical significance of actions of each type, carries over to Figure 3 without modification.

Apart from its location in time, an action of production may now be explained as an agent *arranging* a thing, driven by an idea (perhaps a complex idea composed from several simpler ones; an issue we shall not pursue here): we shall say that the agent produces the thing, driven by the idea. Similarly, an action of interpretation is an agent *perceiving* a thing as being in accordance with an idea (again possibly complex†): the agent interprets the thing as being in accordance with the idea.

I have not said that the perception involved in interpreting a thing causes an idea to exist in the perceiver’s mind, but neither have I excluded that possibility. If we interpret something which is new to us by *acquainting* ourselves with it, we presumably acquire an idea of it. If we interpret something which is already familiar to us by *recognizing* it, we probably do not. It is worth noting that our analysis would also be compatible with a view of ideas as permanent immutable denizens of a Platonic realm to which we have some sort of ‘access’. However, a discussion of the nature of ideas per se is obviously far beyond the scope of the present study.

What it may mean for an agent to produce or arrange a thing, driven by an idea, or for an agent to interpret or perceive a thing as being in accordance with an idea, are questions that could be pursued at great length (Dipert offers a sustained discussion of similar questions†). Within the confines of our study there is room only for a few brief remarks.

I assume that when we produce a thing, such as a cake, a sketch, a bench for the garden, or a building, it is adequate to say that we ‘arrange’ it (or, more precisely, arrange the appropriate ingredients, marks on paper, component parts, etc, so as to make up the thing) and that, furthermore, we never do so ‘without having the slightest idea’ of our action or its outcome in advance. How often, for example, have you heard someone exclaim in surprise, ‘Oops, that was a cake I just made!’? Cakes, sketches, benches, and buildings are *artefacts* in Hilpinen’s sense, according to whom they ‘are essentially and unavoidably instances or tokens of certain culturally determined object-types’ (p 67). When an agent intends to make an artefact, he ‘intends to make an object of a certain kind or type’ (p 157). Thus, someone making a bungalow or a cake never does so without
ation of a thing involves its being regarded as an instrument, tool, or artefact and also its having a ‘deliberative history’. My notion of interpretation seems to be compatible with Dipert’s; more precisely, to be a generalization of it.

‡ The designer’s sketch may be considered an artefact used in preparation for the production of another artefact, but unlike the latter, the sketch is produced immediately, as suggested by Figure 2(b).

* See especially his chapter 13 on artefacts. Among the conclusions reached by van Inwagen in Material Beings, one is of particular interest to design theorists, namely that such things as stones, houses, and chairs do not strictly exist! Although this has caused controversy, van Inwagen’s main concern is not with existence but with composition: ‘Under what conditions do things add up to (make up, compose) a thing?’


intending, as Hilpinen would presumably say, to produce an entity of the type bungalow or cake, respectively. (See also Ref 23 for a similar but more elaborate argument.) What I call the idea by which the agent is driven to produce a thing, not only determines a type; the intention, I believe, also determines the specific properties of the thing eventually produced. As Hilpinen says† (p 157), the agent produces the thing ‘under some description’ and ‘such descriptions define its intended properties’ (his emphasis), but (p 158) ‘at least one of the descriptions […] must be a description of some object kind or type […] which the artefact should exemplify’. Thus, what I suggest here concurs with Hilpinen’s analysis—provided, of course, that ‘description’ is not understood too literally as referring to written documents or the like, for that would be to confuse intentions (ideas) with representations.

Note that it is not strictly necessary for us to assume that by ‘arranging’ we actually bring anything into existence that did not exist before (although such an assumption is no doubt both very common, and quite compatible with our present analysis). For material entities, including briefs, representations, and artefacts, can be understood as (ultimately) arrangements of pre-existing ‘simples’ such as elementary particles of matter, and this view may have a good deal to recommend it, as cogently argued by van Inwagen in his Material Beings24. *

Also, it would seem plausible that if we perceive a thing without ‘interpreting’ it (merely wondering what it is), that is because we have no idea at our disposal (yet) with which we can bring our perception of that thing ‘in accordance’. And so, conversely, acquiring (or becoming aware of, or ‘accessing’) such an idea enables us to interpret the thing (seeing, for example, that brown thing on the table as a cake, rather than just seeing it; cf. Dretske’s remarks on perception25).

### 4.1 Escaping the problem of the absent artefact

Let us see how the above analysis of the artefact production process in terms of ideas enables us, at last, to escape the problem of the absent artefact by accounting for the nature of a design representation without dubious references to non-existent things.

We observe from Figure 3 that a design representation is a thing (material entity) related to ideas by actions of interpretation and production in the same way as the design brief and the artefact (once it has been constructed) are material entities so related to ideas. It makes sense, therefore, to think that (on our current analysis) there is no genuine difference in nature
Presumably, however, a design brief would readily be acknowledged as a linguistic expression or utterance; a design representation (if graphical) would less readily be so acknowledged, and the artefact itself still less readily. What the role of language (or symbol systems in general) may be in designing is an interesting issue that we cannot pursue here.

The phrase ‘acquiring or accessing an idea’ is used so as to avoid commitment to ideas as either temporary entities created and sustained by minds, or permanent (Platonic) entities existing independently. To be able to acknowledge the studio work of design students as design representations, we might have to modify the definition in various trivial ways, for example, using ‘tutor’ instead of ‘client’, and ‘pretending to intend’ instead of ‘intending’.

Doodles may be helpful to the designer by virtue of some psychological mechanism, but not, presumably, in such a way that we should include them among the things called ‘design representations’.

Assume that:

(a) there are three agents: the client, the designer, and the maker;
(b) the client has produced a design brief, driven by an idea called ‘the client's artefact–idea’ [performing actions of types 1 and 2];
(c) the designer has interpreted the design brief, thereby acquiring or accessing an idea called ‘the designer’s artefact–idea’ [by an action of type 3].

A design representation is a thing which [performing actions of types 4 and 5] the designer produces, driven by the designer’s artefact–idea, while

(d) intending the client to interpret it (i.e. the thing) as being in accordance with the client’s artefact–idea [action of type 6];
(e) intending the maker to interpret it [action of type 7] and, driven by the idea thereby acquired or accessed (the maker’s artefact–idea), to produce another thing (an artefact) [actions of types 8 and 9]; and
(f) intending the designer himself to interpret the artefact as being in accordance with the designer’s artefact–idea [action of type 10].

Recall that the diagram taken in its entirety shows the types of actions (and suggests something about their temporal ordering) that make up a complete artefact production process leading to the situation when the artefact has been produced and approved. However, what the designer produces should be recognizable as a design representation as soon as he has produced it, even if the whole enterprise is abandoned and actions of types 6, 7, etc, never occur. (For example, the architect’s plans for Mrs Foxberry’s bungalow should be considered a design representation whether or not the said lady decides to have the bungalow constructed.) That is why, in the second part of the above definition, I talk about the designer’s intentions.

Omitting clauses d, e and f would render the definition too permissive; it would inappropriately bestow the status of ‘design representation’ upon any doodle a designer might be induced to scribble when pondering his artefact–idea.

The critical reader may object that these designer’s intentions concern possible future actions on the part of the agents; actions resulting in a
possible future idea and a possible future thing, viz. the maker’s artefact–idea and the artefact. In short, he may complain that my definition refers to, and thus relies on, what might generically be called possible entities. And, he will continue (even if we grant for the sake of simplicity that brief, design representation, client’s artefact–idea, and designer’s artefact–idea remain constant once they have come into play), relying on those possible entities amounts to reintroducing possible worlds by the back door, for are they not the realms to which possible entities must belong? At the very least, he adds, the ontological status (the mode of existence, if any) of possible entities is just as questionable as that of possible worlds!

Does my definition of design representations commit me, then, to admit a category of possible entities into my ontology? I think not, for my imaginary opponent of the previous paragraph should recall that in the definition I did not assume that at some time in the future there would occur certain actions and exist certain ideas and artefacts (and I did not, therefore, refer to these entities in such a way as to imply their existence now). What I did assume was that (now, at the time the designer has just performed an action of type 5) the designer intends that the entities in question (maker’s artefact–idea etc.) exist at some future time. And intending that some entity (thing, agent, action, idea or whatever) $E$ exists in the future is, I submit, to have (entertain, ‘access’) an idea (let us call it an intention–idea); but it is not to believe or imply that ‘in fact’ $E$ exists in a possible world.†

The fact that someone ‘has’ what by the quirks of language we call ‘an idea of a so-and-so’, or ‘an idea of this and that action being performed’ does not imply that any so-and-so entity actually exists or that any this-and-that action actually is performed—even though our common manner of speaking seems to suggest just that.

Another objection against the proposed definition was put forward by a real ‘opponent’, my colleague Sverker Fridqvist of Lund University (personal communication, 30 May 1997). The purpose of the definition, he presumes, is to decide whether or not something is a design representation. But since ideas of other people are not accessible, and the definition is stated in terms of ideas, it may not be possible to decide whether it applies to a given thing. I should think, however, that it is possible for the designer, at least, to decide whether or not a thing he produces is a design representation according to the definition. More objective or ‘public’ criteria would be desirable, of course, but are hard to come by. Indeed, the notion of design representation is ‘historical’ in the same sense that Dipert’s notion of an artefact is (pp 42, 131–135): no physical feature of an artefact is either necessary or sufficient for its being an artefact; a thing’s status as an artefact is ‘ultimately dependent on what an agent once thought about it’ (p

*For a famous discussion of the ontological implications of our usage of language, see Quine’s essay, ‘On what there is’.
†An analogous argument applies in the case of a design student’s pretended intentions.
In this respect, then, I am hardly worse off than Dipert. Fitting his ‘historical’ view of artefacts into established metaphysical accounts may be difficult, he observes, and politely suggests that this may be a symptom of those accounts being ‘possibly simplistic’ (p 135). The same defence would apply to my ‘historical’ notion of design representations.

When producing his representation, the designer is driven not only by his artefact–idea (his idea of ‘the artefact itself’ as our language might mislead us to say), but also by an idea of how the client will interpret the design representation (see clause d of the definition), by an idea of how the maker will interpret it and react to it (clause e), and by an idea of how the designer himself will interpret the outcome of the maker’s reaction (clause f).

If or when, at some time in the future the client does in fact appear (from what he says or does) to have interpreted the design representation as intended, the designer will interpret the client’s action as being in accordance with the intention–idea of clause d. If or when the maker at some future time appears to have interpreted the design representation as intended and has acted accordingly, the designer will interpret the maker’s action(s) as being in accordance with the intention–idea of clause e. And if or when, finally, the designer himself at some future time (by performing an action of type 10) interprets an artefact (produced by the maker) as being in accordance with the designer’s artefact–idea, then the designer will interpret his own action of interpretation as being in accordance with the intention–idea of clause f. But the status of the design representation as a design representation does not depend on any of these hypothetical actions actually being performed.

4.2 An extended view of the artefact production process

The view of the generic artefact production process presented in Figure 3 served us well as a means of analysing the notions of a design representation and hence of designing itself. Still, it is a fairly simplistic view. Since it can be extended and refined without much new conceptual machinery but in a way suggestive of further inquiry, I shall illustrate and briefly discuss how this might be done. Figure 4 shows the extended view of the process, slightly augmenting the graphical symbolism of Figure 3: the temporal sequence of actions is implicitly given by the order in which tails of arrows are encountered when scanning the diagram from the left. Dashed arrows indicate dispensable types of actions. There are four main extensions: (1) a distinction between representations and artefact as belonging to separate ‘levels’ is now suggested, (2) stages of development over time (left to right) of representation and artefact are indicated by angular partitions within
As before, each agent may be an organization comprising several persons. For each agent, an initial and a final artefact–idea are shown by nested boxes. The client’s initial idea is labelled ‘as-conceived’. By some cognitive process, the nature of which I shall not attempt to analyse here, he reaches a final ‘as-specified’ idea, driven by which he produces the (final) design brief, and in accordance with which he interprets it. In practice, of course, several preliminary steps involving preliminary versions of both idea and brief may be needed. The designer interprets the brief in accordance with an ‘as-specified’ idea which is his initial idea. By a similar, probably iterative, cognitive process he comes to entertain his final ‘as-designed’ idea from which the design representation is produced. The remaining agents work analogously.

In the scenario considered here, the user or manager contributes to the production of the artefact. Taking again an architectural example, the artefact might be an office building, and the user a firm or a ‘facilities manager’ whose modification consists in the addition of carpets, furniture, computers and other equipment, and possibly in rebuilding some of the offices. Such modifications are suggested by the transition from ‘artefact as-made’ to ‘artefact as-used’.

Figure 4 An augmented view of the generic artefact production process from Figure 3, now including the user or manager of the artefact
The design representation may undergo a similar and parallel development by the hands of the maker and user. (May, but need not; hence the dashed arrows.) For example, a design database holding project information generated by an architectural firm (the ‘design representation’) may be augmented by the contractor (maker) who is to construct a building accordingly. He might add technical details to the database (transforming it into an ‘as-made representation’) so as to be able to extract the ‘shop drawings’, etc, needed by his workers. In the ‘post-occupancy’ stage, the same database (or part of it) would be used by the owner (user, manager) of the building for management of equipment, maintenance, and leasing.

The detailed diagram in Figure 4 subsumes the earlier steps of our analysis, but it has, to my mind at least, considerably greater intuitive appeal as a starting point for inquiry into the cognitive processes underlying the production and use of artefacts, and into more practical issues, notably issues of information technology as a representation medium. However, such additional inquiries, like the more philosophical ones hinted at earlier, would take us far beyond the scope of the present study.

Another elaborate, but different, view of the artefact production process has been proposed by Roozenburg and Eekels who analyse it initially in such terms as ‘form’, ‘properties’, and ‘function’ of an artefact; the ‘needs’ the artefact satisfies; and the ‘values’ thereby brought about (Sections 4.1–4.3). They see the entire process of planning, design, and manufacturing of artefacts (‘products’) as a complex ‘technical action’ which they portray in detail as regards its means, ends, and value judgements. The design of a product is explicated as ‘the geometrical and physico-chemical form [the latter refers to properties of materials] that the product must have after the manufacturing process’, which ‘has been thought up by a designer and laid down in a technical drawing’ (p 55). The design in this sense is taken to belong to the ‘domain of the mind’ (diagram, p 65), and thus resembles what I have called an ‘artefact–idea’. Hence, Roozenburg’s and Eekels’ analysis of the process seems, on the whole, to be compatible with the one presented above, but complementary to it: the former emphasizing the ingredients of ‘technical action’, the latter emphasizing communication among the agents involved.

5 Conclusion: drawing up the balance sheet
We sought ‘a simplifying paradigm of design’. I propose, as such a paradigm, the notion of design(ing) as production of a design representation, where ‘design representation’ is defined as in section 4.1. The context of the definition is the notion of the generic artefact production process as analysed throughout the paper, and as summarized most suggestively in
the extended diagram (Figure 4). It is time to draw up the balance sheet of the philosophical commitments incurred.

We took it for granted that there are human agents (individuals or groups of collaborators) and material entities upon which they act and react by ‘producing’ and ‘interpreting’, so as ultimately to produce artefacts. It was nowhere necessary to assume that human agents actually create material entities (though such an assumption is compatible with our analysis); assuming that material entities can be ‘arranged’ was sufficient. Essentially by making these rather modest assumptions we could account for the use made of design representations in a process of artefact production (section 2).

When it came to explaining what a design representation is (section 3), we had to make more generous assumptions, committing ourselves to ‘ideas’ as entities in a mental or cognitive realm (section 4), as opposed to the non-mental, or non-cognitive, world* of actions, agents and (other?) material entities.† For the ideas to serve our purpose, they had to be engaged in actions of production whereby an agent arranges a non-cognitive (material) entity ‘driven’ by one or more ideas, and in actions of interpretation whereby an agent perceives a non-cognitive entity (possibly another action) as being ‘in accordance’ with an idea; perhaps one induced in his mind for the occasion. Among the terms slipped into our analysis as primitives (and there has to be primitives for the analysis to terminate), several could give rise to considerable controversy; for example, ‘future’, ‘action’,‡ ‘perceive’, or ‘driven by’ when referring to a relation holding between agents and ideas (is it a causal relation, for example; and if so, what is causation?).

As anticipated in the opening paragraphs of section 3, the artefact–ideas, in return for the philosophical assistance they afforded us in escaping the problem of the absent artefact, seem to claim the right to make propositions true or false; a privilege one would have tended, prima facie, to grant more tangible entities, such as material things. There has to be a debit side of every balance sheet, and our puzzlement over the idea of a house complying with the fire safety regulations, in lieu of the house itself, admittedly belongs there. But does that make our position untenable? Without plunging into the deep waters of theories of truth and perception, I believe the puzzlement can be eliminated or at least reduced to a tolerable level. To achieve this, one might appeal to epistemological problems of acquiring ‘objective’ knowledge of a putative external reality: it is hardly an original observation that asking for such knowledge is a rather tall order, and that we ‘see’ reality though the mental filter of our ‘ideas’ or conceptions. If

*An assumption commonsensical enough, albeit with Berkeley as a prominent opponent32 (chapter 3).
†Whether or not the agents (human beings) can be considered entirely material is a standard issue of controversy in metaphysics32,33 (chapter 9 of the latter reference). There is no need for us, however, to take side.
‡See Dipert’s6 chapters 3 and 4 for an analysis of the notion of action.
we accept this (commonplace) observation, it is hard to see how one could ever talk about reality except through the very same filter. Hence it is not, after all, so far-fetched to think that what we talk about is never the external reality ‘itself’ (despite the fact that we boldly use language as if we did), but rather our ideas about it.* And that would seem to account for the (no longer so) puzzling feature of design discourse that the truth makers of our utterances are cognitive entities, rather than material ones.

Trusting that a defence could proceed along these lines, I think that our position is indeed tenable, and that on the whole we have avoided such primitives or assumptions as would be too much at odds with common sense to claim broad acceptance. On the credit side of our balance sheet we may also list the fact that (after switching to ‘the second approach’) we succeeded in explaining the nature of a design representation (actually defining it) without being lured by ordinary locutions into implying the existence of artefacts not yet existing, and without extravagant assumptions of the reality of possible worlds or future entities. As we saw, the explanatory work of possible worlds or future entities could be done instead by ideas which exist now, yet being ideas of things or actions intended to exist and occur in the future. (Where, in the manner of Goodman, the italicized phrase names a one-place predicate applicable to ideas, not a two-place predicate applicable to an idea and a non-existent ‘future entity’!) Entertaining such ideas is, I believe, what makes human beings capable of planning in general.

Acknowledgments

Originally, I conceived of artefact production only in terms of two agents: designer and maker. I am indebted to my wife, Anne Lise Kjær, for suggesting that the client be included in the analysis as well, and to my colleague Rob Howard for reminding me of the role played by the user or manager. I would also like to thank Dr C. Baljon, who was the first to draw my attention to Goodman’s *Languages of Art*, and Professor Risto Hilpinen, who provided valuable support by reading draft versions of the paper and exchanging comments, reprints and references with me. The kind advice of an anonymous referee to consult Herbert’s book *Architectural Study Drawings* (and Carey’s essay, ‘A cultural approach to communication’), although prompted by a draft for a different paper, has also been helpful in the preparation of the present one. Last but not least, I highly appreciate the thoughtful and stimulating criticism and comments offered by Mr S. Fridqvist, Dr Anders Ekholm, Professor Norbert Roozenburg, and by two anonymous referees.

*To the extent that these ideas are related to external reality (for instance, through actions of interpretation and production), we may justifiably claim to be talking about such reality too; but only indirectly.