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## Exploring Standards of Rigour for Design Cases

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### Abstract

Designers share their specialized knowledge by developing design cases, which we define as representations of design efforts and outcomes disseminated to peers. In the field of instructional design this practice is not well established. In addition, many fields in which design is practiced are examining how knowledge is built by designers, and considering the methods of research most applicable to building design knowledge. We consider design cases to be the method of dissemination for that design research which is wholly of a piece with the act of design (as compared to design research carried out in the process of designing or research on design). In considering the factors required to establish this practice, we understand the issue of rigour to be critical, since without standards by which to judge the rigour of a representation this form of knowledge building may always be undervalued in comparison to others. We look to naturalistic inquiry and action research to begin exploring how rigour might be approached in developing design cases, presenting from the perspective of instructional designers and hoping to engage designers from other fields insofar as these ideas are useful to them.

### Keywords

Design Knowledge; Knowledge Building; Case Study/Studies; Design Research

### Context

To set the context for this discussion, the authors of this paper present our combined experience, describe our current field of practice and set out in some detail what we mean by the term *design cases*.

### ***Past experience and current practice***

The authors have studied and practiced in fine arts printmaking and in architecture/landscape architecture respectively, and have both practiced in graphic design, visual interface design for software development, instructional illustration, identity design and instructional design. Of these, instructional design may be the least familiar to readers from traditional design fields. In this field, professionals design instructional materials, full training programs, and other interventions related to teaching and learning. Instructional designers assess the need for instruction, analyze contexts and learners, match instructional strategies to types of learning required, specify materials to be developed and establish the evaluation processes that are used to judge the quality of programs. The field has been associated with systems thinking and still emphasizes process models as the primary focus of design.

## **Design cases**

In many established fields of design practice the dissemination of design knowledge includes production and distribution of what we are calling design cases. We recognize that this term may not be understood to mean the same thing across disciplines, but we define design cases as visual/written representations of the product of design, and, to a greater or lesser extent, of the process of designing that specific product. Design cases are produced for the purpose of sharing knowledge with other designers.

We use the term "design case" to distinguish the topic of this paper from "case studies," in which researchers set out to study an instance of design or designing, and from several forms of "design research," in which designers set out either to study the process of design, or to collect information as part of the activity of design. The forms of case studies range from the most minimal (a single image, with attribution to the designer(s) and identification of client as seen in popular design publications) to in-depth examinations of impressive designs and/or design failures (e.g., Petroski, 1994).

By design knowledge we mean the special form of knowledge which is created in the activity of designing and reflecting on that activity, and the knowledge contained in the products of designing (Cross, 2001; Lawson, 2004). We use the term "product" to mean the product of design, which may be an artefact, a system, or an experience.

## **Purpose**

In instructional systems design, the field in which the authors of this paper practice currently, some design cases are generated and published for use in teaching (Ertmer & Quinn, 2003), some for use in research on design processes and activities (Richey, Klein & Nelson, 1996) and some for in-house use in proprietary situations where groups of designers share them as a private store of precedent. However, production and publication of professional (versus teaching) design cases in this field of practice are not common and there is virtually no infrastructure in the field (specialized publications, competitions, established tradition or expectation of case development as part of professional practice) to support this activity. If such a tradition is to be established within instructional design, we expect the issue of rigour to be raised early. This is because, within the study and practice of instructional design, design cases (with the exception of those case studies used for traditional research (Richey, Klein & Nelson, 1996)), are not generally recognized as knowledge dissemination in the same way as are the conventional research studies assumed to be the central method for knowledge building in the field.

In working to establish the value of design cases and to introduce the practice of developing design cases in this field (Rowe, Smith & Boling, 2005; Boling & Smith, 2008), we have turned to other design fields. Despite the common practice of producing and publishing design cases, there do not appear to be either explicit standards for their development, or guidelines to ensure rigour in the development of such cases. In part this may be because design cases are so much a part of accepted practice that expectations for them are widely internalized, passed along to novices by demonstration and

modelling, and therefore remaining implicit. Even in those fields in which the production of design cases is widespread and well supported (architecture, product design, graphic design, software interface design, design engineering), there may not be recognition of the possible need for explicit standards of rigour to be applied to such representations of design and design activity.

We are aware that many scholars are trying to establish the view that design activity itself is research, and that others are working to increase the rigour with which design research is carried out during the process of design. These purposes are not identical to ours; we are focused on representations of design outcomes themselves, some of which also include descriptions of how those designs were created.

While the activities of designing may be carried out with more or less rigour, and the representation of those activities may be carried out with more or less rigour, rigour in the design case as we are discussing it refers to the documenting and representation of those activities.

## **Types of design cases**

Types of professional design cases may be determined by the uses to which they are put, since a case in almost any form can be put to multiple uses. In the experience of the authors, several types of cases may be identified in the various publications where representations of design artefacts appear. Of those listed below, we are primarily concerned with the first two in this paper:

- precedent building – cases used to build a body of precedent for individual designers or design groups/communities
- diagnostic – cases used to analyze failure in design
- process cases – cases used to examine the process of design
- theoretical cases – cases describing conceptual or hypothetical designs, used to explore or stimulate new directions in design
- marketing cases – cases used to highlight the positive, interesting or special aspects of a design for marketing purposes
- teaching cases -- cases describing conceptual or hypothetical designs, used to expose students to specific design situations, dilemmas or processes or to encourage reflection and discussion of issues in design
- research cases – cases used to examine aspects of design process, design thinking, or other facets of design

In each of these situations, the rigour with which a case is assembled and reported may be required to a higher degree than in others, or along different dimensions, but Nigel Cross (2001) has stated unequivocally that “We (the broad design community) have to be able to demonstrate that standards of rigour in our intellectual culture at least match those of the others (the sciences and the arts).” We propose, from the perspective of a practice just beginning to establish the habit of developing and disseminating design cases (instructional design), that such standards can be articulated and may be

applied explicitly to all varieties of design cases, albeit in proportion to their formality and intended use.

We consider here the situation in which a comparatively full description of a design is provided together with a full discussion of the design process because this is the situation most likely, in our view, to be accepted within instructional design as valid knowledge building. These situations may be analogous to, for example, in-depth documentation of a product design to appear in a magazine as a precedent resource for professionals in the field. We recognize that this does not cover every possible permutation of the design case; we address this subset as a viable starting point with relevance to instructional designers and possible relevance to other designers.

### **Exploring standards of rigour**

What would constitute rigour in the kind of knowledge building represented by production and dissemination of design cases? We propose to look to several conceptual frameworks commonly applied in social science to begin formulating an answer to this question: specifically, the framework for establishing trustworthiness in naturalistic inquiry; and the rules for minimizing threats to validity in action research. In doing so, we recognize that implicit standards of rigor already in place in communities with well established traditions of developing and disseminating design cases are likely to coincide with many of these; we are looking to inform practice in our own field rather than to critique that of other design disciplines. To the extent that our explorations might prove useful, however, we welcome the chance to discuss them across multiple perspectives in the design community.

### **Naturalistic inquiry**

Why look to naturalistic inquiry? Naturalistic inquiry may be seen as an applicable framework for design cases because the primary conditions are similar to those involved in representing design activities. It is carried out within a natural setting, rather than an experimental one. It uses the purposeful sampling of data, selecting that most likely to “provide substantial contributions to filling out the structure and character of the experience (Polkinghorne, 2005; p. 139), and the human being as the instrument of data collection and analysis. The purpose of naturalistic inquiry is to arrive at negotiated outcomes – meaning that the players in a situation must all see the report of the study as representing their views legitimately, and that biases and constraints on transferability must be recognized explicitly (Lincoln & Guba, 1985).

### ***Methods in naturalistic inquiry***

In naturalistic inquiry, the trustworthiness of findings is defined by the degree to which methods ensure credibility, transferability, dependability and confirmability of methods, data and findings. Trustworthiness is promoted through particular methods: prolonged engagement with the phenomenon under investigation, “persistent observation of salient elements,” triangulation of data, negative case analyses, peer debriefing, member checks, thick description and audit trails (Lincoln & Guba, 1985; pp. 247-8). Each of these

may be discussed with a view toward considering how they might be applied to design cases, or representations of design products and processes.

In many cases, the designer, or designers, of the product represented in a published case will be the designer(s) of that product, and consequently as authors they may be assumed to have prolonged engagement with the project of design. However, in many cases, a single designer, or even several designers, engaged in producing a design case may not be the only designers involved in the project. A project may be carried out over a span of time, with different individuals involved, or may have been carried out by multiple specialists who are not all involved in producing the design case. In these situations, we speculate that a rigorous case would include careful disclosure of the role(s) of the author(s) in the project, as well as those of others. Similarly, the evidence of "persistent observation of salient elements" will be assumed for design cases with single authors who are also the sole designers of the products described, but will need to be established by giving details of a project's duration and the role(s) of the author(s) in the design project. In the situation of an author who was not a participant in the design process, the case would need to provide details of how that author obtained information about the case, and from whom.

### ***Triangulation of data***

Triangulation of data, or the use of multiple informants and/or sources of data, might be applied to design cases on a sliding scale depending, again, on the scope and complexity of the case. In large or complex projects, author(s) wishing to establish trustworthiness may need to present evidence of engaging more than one participant in development of the case and referring to multiple documents from the design process.

### ***Negative case analysis***

Negative case analysis, a method focused on seeking out disconfirming evidence or informants, increases trustworthiness by showing that the researcher has engaged perspectives that challenge her theory of the situation under study, and therefore has not sought or settled on only those that support her view of the situation. In the design case, this method might translate to the practice of reporting on false starts, concepts applied and abandoned, or decisions reversed or altered as a result of usability studies or design walkthroughs. Such a practice is particularly absent in those design cases that do appear in the instructional design field

### ***Member checking***

Member checking, or sharing findings (the representation) with those involved in the project, and peer debriefing, or discussing one's findings with others knowledgeable in the domain, might or might not find an analogue in producing a design case. For historical cases, these methods might be applied by an author who was not part of the design process in almost exactly the same manner as in a social sciences study. For design cases that undergo some form of peer review, such review could also serve as a form of member checking. In fact, peer review of design cases (which is carried out by expert juries for many traditional design publications now), might be

extended to encompass not only the assessed quality of the product being described, but the trustworthiness of the case itself.

### ***Thick description***

Thick description in social science research is usually assumed to be verbal description, whereas in many design cases a thick description can be provided with one or more images – although for many projects a “thick” description would require multiple images, and likely images of stages in the design process, concept sketches, or other documents in addition to images of a product. In the case of designed experiences, a rigorous case might need to include a significant number of images and/or a sufficiently detailed verbal description to give readers a good understanding of the experience. It is this dimension of trustworthiness that design cases in traditional fields of design often fulfill best, and that such cases as exist in instructional design surprisingly often do not.

The audit trail, consisting of careful records employed in order to verify the thick description, is a feature of naturalistic inquiry that depends on the researcher knowing at the outset of a project that it will be reported later. Some design projects may unfold in this way, while others may become the subject of a design case after the opportunity to establish an audit trail has passed. However, in a design culture that values sharing knowledge via design cases, participants in a project may automatically preserve some sort of audit trail in the form of notes and sketches saved in an organized form as a matter of habit. In creating such documentation, attention would have to be paid to the capacity of that documentation to communicate beyond the designers who generated it, as well as its utility to future documentation efforts as a model that could be applied beyond the single case.

While these specific methods may not translate directly to all, or perhaps any, instance of developing a design case, the intellectual stance required to carry out these methods is one of awareness that representations of designs contain knowledge worthy of preservation and study. This stance may usefully inform designers, and give rise to conceptual guidelines that promote rigour in developing and reporting cases, as well as illuminating the positive practices already in place among experienced and skillful designers reflecting on their own work or that of others. For designers working in fields without a history of producing design cases, and perhaps in fields with implicit or ill-defined standards of rigour, the adoption or adaptation of these methods would carry implications for revising habitual practices and for teaching design practices.

### **Action research**

Why look to action research? In action research, a subset of the naturalistic perspective, the researcher is an actor in the situation or activities under investigation. In those situations, all participants are engaged in bringing about some desired outcome, as well as in building knowledge. These two fundamental aspects of the action research approach renders discussions of rigour especially salient to the dissemination of knowledge via design cases since the actors in a case are frequently also those individuals reflecting on it and representing the knowledge gained..

### ***Methods in action research***

The action research approach ensures rigour by encouraging participants to “engage in public reflection on substantive matters of concerns to them” and making possible “the public testing of knowledge claims” (Argyris, Putnam & Smith, 1985, p. 236).

### ***Public reflection***

Public reflection on substantive matters may be seen as a practice related to the use of negative case analysis in that reflection involves the conscientious examination of practice, including both what works well and what does not. As with negative case analysis, we see this standard of rigour as requiring that design case authors discuss the true thinking behind their decisions and the outcomes of both interim and final decisions made during a project. These discussions may need to be sampled rather than being exhaustive if the design case is to meet space constraints and possibly to communicate clearly and effectively to other designers. Sampling may be carried out in several ways (Polkinghorne, 2005), most of which might usefully be considered in the context of design cases:

- maximum variation – decisions or features of a project selected for their breadth of difference
- typical – decisions or features selected for their commonality and ability to illuminate the primary character of the project
- extreme – deviant decisions or features that illuminate the character of the project through contrast
- critical case – particularly significant decisions or features, “because of their intensity or irregularity” (p. 141)
- criterion – decisions or features meet a criterion established in advance, perhaps for a design case developed to highlight certain aspects of design process or thinking (or to show the author(s) only in a positive light; not very rigorous, but certainly possible)
- confirmatory and disconfirmatory – in social science research, these are cases that support and do not support the developing hypotheses (descriptions) of the situation under investigation; in a design case these might be decisions and features of the case that illuminate both fruitful and unfruitful decisions or directions taken during the project
- convenience – decisions or features most easily remembered or represented

In action research, making this reflection public contributes to trustworthiness by revealing the perspectives of those involved in the research and allowing readers to form their own conclusions regarding the circumstances and implications of the situation. This approach to rigor seems especially appropriate for design cases, which may be developed for specific purposes but are generally used for whatever purpose the reader needs to fulfill. (For example, a case may be published as a process case, but be used by the reader as a precedent-building case.)



### **Public testing of knowledge claims**

Public testing of knowledge claims involves reporting on activities undertaken to test hypotheses developed during an action research project. The clear implication here is that such activities *are* undertaken, meaning rigour in the representation of the project requires, in this instance, rigour in the conduct of the project itself. For example, if an author reports that certain problems were detected in a design, standards of rigour might require that the author report the specific details of usability data that revealed the problem. In order to report such data, the project participants must have carried out usability tests. This requirement stands in contrast to other possible standards which do not require correspondence between rigour in representation and rigour in action. One may develop a rigorous representation of a design process during which little rigour was exercised. This might, in fact, be a useful design case.

Public testing of knowledge claims might also dovetail with the audit trail method which is a staple of naturalistic inquiry. When a claim is made in a design case regarding the activities of design, or the performance of a product, the amount and relevance of detail backing up that claim is also an element of trustworthiness.

Our examination of the implications of action research for designers suggest that guidelines for development of design cases would address both the nature and amount of information provided within the case, and the commitment to a certain quality of communication before and after the production of the case. This requirement for preparation – for the consciousness that a case will eventually be produced and the attendant activities required to prepare for it -- would impact the design process in situations where designers wish their work to be accepted as rigorous contributions to knowledge.

### **Rigour in design cases**

At this point it may be useful to reiterate that not every design case requires the same standard of rigour to be useful. A minimal case may require high-resolution reproduction (and would be less rigorous if the reproduction were pixilated) and identification of the author, but not require comprehensive detail like preliminary sketches, discussion of context and process, and so on in order to be useful as precedent for another symbol designer.

On the other hand, some existing cases might be more useful if they were more rigorous. Although “expert designers are solution-focused, not problem-focused” (Cross, 2004; p. 439), the experience of solutions on which they draw is specific to problem type. We take problem type to mean not just the gross classification of problems (architecture, graphic design, product design), but also finer grained classifications which may be apparent on the surface of a minimal design case (the individual symbol reproduced in a magazine; three photos of a new building), but not as apparent even in an elaborated case which fails to specify the duration of a project, the role of the author or the major points of the original brief.

Adopting standards of rigour adapted from social science research may imply that design cases requiring a high level of rigour will be lengthier than cases which do not require such a high level of rigour, but the length of a case does

not guarantee rigour. If a case is developed by an author with minimal experience of the actual project, or the case presents a lot of detail about the project but with no reflection on the genesis or progression of decisions during the project, it would not be judged to be rigorous.

Depending on the audience, thoroughness and explicitness in a design case may be achieved through shorthand (see Figure 1.). Shared vocabulary and the ability of readers to interpret terms into which much meaning is condensed (“clean,” “vigorous”) may allow an author to produce a concise design case that is also rigorous, although a different audience might find the case less than rigorous. In addition, cases can be produced for specific purposes but may also be used for the purposes of their readers. This may not be possible in every permutation; any case that offers a representation of the product of the design might serve as a precedent case for its readers despite the author’s intended purpose, but the minimal case intended as a precedent-builder probably cannot be used effectively as a diagnostic case.

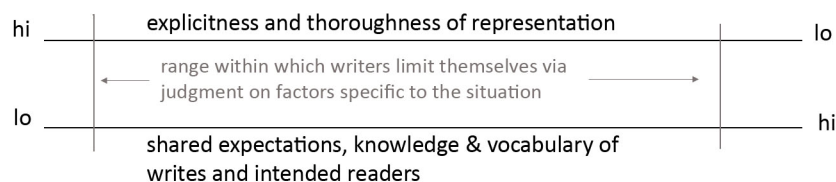


Figure 1. Model of factors in deciding how explicit and thorough a case should be

## Summary

The authors address the instructional design community as a primary audience, one which we presume does not engage as a matter of standard practice in the development of professional design cases. This means that some of our discussion of a rigorous approach to design case development informed by the practices of naturalistic inquiry and action research will amount to assumptions already held by members of other design communities. However, we anticipate that even so there may be value in discussing those implications explicitly and with a view toward reaching some agreement on their overt articulation. We also hope to have the input of design professionals from other fields of practice as we work through these ideas in the context of our own practice and teaching. We intend next to review existing design cases across disciplines in the light of these ideas. This will be a grounded study that identifies the features of those cases which might be understood to satisfy or not satisfy standards of rigour as adapted from naturalistic inquiry and action research, as well as features of the cases which suggest additional or alternative applicable standards.

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