

The Mechanisms of Value Transfer in Design Meetings

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Abstract

We are interested in how values are transferred in the collaborative design process. By values, we mean the principles, standards, and qualities that guide actions. As designer and client co-design the artifact, they share and transfer ideas and concepts among themselves. We examine the interactions between architect and clients to investigate how each party reveals and responds to the different values brought to the design discourse. We analyze the verbal content and non-verbal communication cues from two design meetings and identify a pattern of discourse when both architect and client discuss values.

1. Introduction

1.1 Values in Design

The idea of values is an important issue in design. Going back to the Roman architect Vitruvius, he wrote that a building should have the qualities, or values, of "firmitas, utilitas, venustas" –stability, utility and beauty (Pollio 1914). Beyond architecture, designers from all fields, from industrial design to interaction design, work with values. It is during the design process that the designer and client communicate and collaborate to jointly develop a discourse of understanding and shared values.

Design research has considered many different aspects of design practice. Lawson and Rowe each contributed to work focusing on design process and the individual act of designing (Lawson 1990; Rowe 1995). Brereton, Cross, and Radcliffe have studied the affects and mechanisms used in team-based design (Brereton, Cannon et al. 1996; Cross and Cross 1996; Radcliffe 1996). Looking specifically at visual design, Frascara and Tyler address the role of values and audience. Frascara considers graphic design as primarily an activity of persuasion and asserts that graphic artifacts should be considered on more grounds than aesthetics alone (Frascara 1995). Tyler echoes a similar view in the scope of visual communication design. He further discusses how the audience's values influence their interpretation of the design and the persuasive power it possesses (Tyler 1995).

Despite the fact that values are an integral part of the process, their specific contribution to the artifact is often overlooked. In Brereton's Delft Protocol analysis, designers were noted to make appeals to values, e.g. Kerry, one of the designers working on designing a bicycle rack, makes an appeal to *elegance*, but there was no deeper analysis of how values contribute to the design (Brereton, Cannon et al. 1996). Likewise, methods such as Cultural Probes are explicitly aimed at eliciting and interpreting values; however, their role in the design process is simply described as inspirational and the manner in which the results of the probes are internalized by design teams has not been investigated (Gaver, Dunne et al. 1999).

Much of the work in looking at values comes at a time when the broader field of Design is in the middle of an evolution where the "Consumer" is becoming a "Co-designer" (Sanders 2005). This change indicates a shift in how values are reflected in the design process. Where a consumer simply takes what is given, the co-designer is empowered to accept and reject design choices and influence the final product (Sanders 2006). This evolution toward co-design is happening at different speeds across the different design domains.

In the domain of Human-Computer Interaction (HCI), more researchers are considering "value" as an integral part of design and evaluation. The conversation about values in design started with Suchman's seminal article "Do Categories Have Politics?" where she lays the foundation for discussing how values are built into software systems (1997). Suchman's work is based in the Participatory Design tradition that emerged in the 1960's and 1970's (Sanoff 1973). This same tradition provides the underpinning Sanders identifies as motivating design disciplines toward co-design.

Work done in HCI has produced several approaches for how to cope with values in the design and evaluation of software systems. Friedman's Value Sensitive Design (VSD) is a methodology that specifically asks questions about values and proposes a methodology that uses conceptual, empirical, and technical investigation to identify and address values in software systems (1996). Blythe and Monk suggest that technology designed for the home be analyzed using three scales: enjoyability, inclusivity, and recodification which stand in contrast to the traditional scales used in HCI of efficiency and productivity (2002).

Looking outside of HCI, social researchers have taken on understanding how technologies emerge in society. Social Shaping of Technology (SST), put forward by Williams and Edge, asserts that technology is developed through the negotiation of social, technical and economic factors (1996). In this regard, VSD and SST are similar as they both emphasize the interplay between the development of a technology and the socio-technical system that gave rise to, and eventually adopts that technology (Friedman and Peter H. Kahn 2003). In this case, we consider technology as any intentionally designed artifact and do not limit the definition to computational devices.

Our goal here is to establish a better understanding of how architectural design incorporates values into the design process. By analyzing one specific design process, we hope to create a framework to understand design process across different domains.

1.2 Definitions

In this paper, we examine the role values play in design. Before presenting our analysis, it is important to acknowledge the breadth of meaning encompassed by the term "value." We consider values to include *the principles, standards, and qualities that guide actions*. These may be personal, cultural, or professional. Ultimately, values are the basis for how the designer and the client assess the design.

As we examine two Architectural design meetings, the kinds of instances that we are associating with the communication of values include assertions of form or aesthetics, descriptions of how people are to use the space, and anecdotes that illustrate the human condition behind the function. We are referring to communication about these aspects of the design as "design discourse."

Finally, we use the word "client" to refer to the person who conveys the needs of end users and owners. The client represents stakeholders and communicates concerns of value assessment or judgement with the designer.

We now turn to examining how designers and clients negotiate and communicate their individual values during the design process. The values the designer brings to the design meeting include professional expertise, knowledge of the design domain, and the personal values that make up their individual character. Likewise, the client comes to the design meeting with notions about how the artifact will be used and how it will fit into their lives. Some of the client's values will correspond with those of the designer. Some values will be foreign to the designer and these must be understood so the design can evolve to the satisfaction of all stakeholders.

It is our assertion that in order for the designer and the client to come to agreement on a suitable solution each must begin to understand each other's values. As we will see, this horse-trading of values occurs more vigorously during analysis and synthesis phases of design. As the design evolves toward completion, these values are used in the design meetings to further define, validate, and assess the proposed design solutions.

2. Data and Methods of Analysis

Our data set included two recorded meetings between architect and client for a crematorium design. We chose to focus on these two meetings because they consisted of direct contact between the designer, Adrian, and the clients, Angela and Chris. The first meeting was held January 19th, 2006 and centered on Adrian's presentation of drawings and site plans that were part way through the design process. The second meeting was on August 14th, 2006, seven months later, and presented revisions to the design as discussed in the first meeting with the goal of finalizing the design so planning could begin.

We will refer to the first architecture meeting and second architecture meeting as A1 and A2 respectively. References to the transcripts will include the meeting and the transcript line, e.g. A1, 140.

Over the course of the two meetings we were particularly interested in identifying how each party talked about values. In order to begin to understand the type of social transactions that enable value transfer we undertook an approach based on Grounded Theory. Grounded Theory is a systematic methodology of qualitative data analysis. The generation of a grounded theory starts by coding minute detail in the transcribed content. These codes are then refined and larger-grained categories are created. The goal of Grounded Theory is to end up with one central category that relates all observed behaviours (Miles and Huberman 1994; Strauss and Corbin 1998).

We applied the methodology of Grounded Theory to the Architecture protocols. We examined the transcripts iteratively, applying open coding and line-by-line analysis that paid specific attention to incidence of value transfer in the following events:

1. Verbal exchanges that explicitly revealed values to be reflected in the final design.
2. Verbal exchanges that were implicitly about values and their relation to the design.

Extract 3, A2, Example of Requirements, Physical

1756 Chris yeah what about religious () religious symbols
 1757 Angela yeah I mean we'll be inviting the inter-faith groups and we've just
 1758 had the Sikhs donate err- a symbol to us as well er and so it's just
 1759 trying to think about how we would allow a symbol to be shown that
 1760 would be removable in a sense or something like a cross because it
 1761 can't be + one faith
 1762 Adrian well there's a couple of ways of doing it you could add the symbol on
 1763 the plasma TV screens

“Narrative” codes include direct support, indirect support, process detail, justification, and tangent. These codes identify pieces of text in the transcripts that support functional requirements for either of the categories of values. They represent the anecdotes and justifications offered in support of a particular idea.

The final category, “Process,” contains the codes communication and problem solving. The code communication is used to identify when either client or designer refer to communicating with stakeholders who are not present in the meeting. Problem solving is used to identify the design discourse that centers on defining the functional requirements. This category needs further development, as the codes that belong to it do not have a particularly strong affinity. See Table 1 for a summary of the categories and codes used in the analysis.

Table 1. Behavior Categories and Codes

<i>Behavior Categories</i>	<i>Codes</i>	<i>Description</i>
Design Values	Form, Material, Aesthetic, Uniqueness, Purity, Solitude	Applies to comments about architectural purity or vision, to form and material, as well as perceptual awareness.
Human Values	Spirituality, Respect, Jealousy, Family, Religion, Mourning, Comfort, Tradition	Identifies phenomenological experience and symbolic meaning comments that may or may not directly result from the designed space.
Requirements	Activity, Spatial, Physical, Review	Reserved for comments that addressed functional needs or activities that take place in the designed space.
Narrative	Direct Support, Indirect Support, Process Detail, Justification, Tangent	Used to identify anecdotes that either designer or client engaged in during the discourse.
Process	Communication, Problem Solving	Delineates meeting activities concerning meeting mechanics or when additional research would be needed.

3. Results

The summary of events for each category for A1 and A2 can be found in Tables 2 and 3 respectively. These tables display the number of behavior codes contributed by each participant along with the percentage of their total contribution that comes from that code; e.g. in Table 2, Adrian contributed 53 instances of codes in the Design Values category which is 46% of his total contribution. Tables 2a and 3a show the distribution of all codes between the participants and give an idea of where the action took place during the design discourse.

Table 2. A1 Category Summary

	Design Values	Human Values	Narrative	Requirement	Process
Adrian	53 (45.7%)	9 (7.8%)	26 (22.4%)	13 (11.2%)	15 (12.9%)
Angela	16 (17.4%)	15 (16.3%)	32 (34.8%)	24 (26.1%)	5 (5.4%)
Chris	1 (5.9%)	-	2 (11.8%)	10 (58.8%)	4 (23.5%)
Cat. Total	70 (31.1%)	24 (10.7%)	60 (26.7%)	47 (20.9%)	24 (10.7%)

Table 2a. A1 Distribution

	Contribution Total
Adrian	116 (51.6%)
Angela	92 (40.9%)
Chris	17 (7.6%)
Category Total	225 (100%)

Table 3. A2 Category Summary

	Design Values	Human Values	Narrative	Requirement	Process
Adrian	31 (41.3%)	-	22 (29.3%)	6 (8.0%)	16 (21.3%)
Angela	16 (20.5%)	11 (14.1%)	30 (38.5%)	18 (23.1%)	3 (3.8%)
Chris	1 (14.3%)	-	1 (14.3%)	3 (42.9%)	2 (28.6%)
Cat. Total	40 (30.0%)	11 (6.9%)	53 (33.1%)	27 (16.9%)	21 (13.1%)

Table 3a. A2 Distribution

	Contribution Total
Adrian	75 (46.9%)
Angela	78 (48.8%)
Chris	7 (4.4%)
Category Total	160 (100%)

Both meetings exhibit roughly the same pattern. Across the two meetings about 30% of the time was spent on Design Values, 10% on Human Values, 30% on Narrative, 20% on Requirements and around 10% on Process. The contribution of coded events is roughly even between architect and client as seen in Tables 2a and 3a. A closer examination of Tables 2 and 3 shows that in A2 there is a decrease in the number of Design Values codes (30% down from 31.1%), Human Values codes (6.9% down from 10.7%), Requirement codes (16.9% down from 20.9%), and an increase in Narrative and Process codes (from 26.7% to 33.1% and from 10.7% to 13.1% respectively). The broad stroke picture that these numbers paint is that by the second meeting, A2, there was a decrease in discourse that included requirements and values. The notion that many requirements and values were already captured in the design artifact and no longer required discussion could explain the decrease in value discourse.

Another, perhaps better, indication of the content of the meetings can be found by looking at the contribution by each participant for each category. Tables 4 and 5 show how each participant contributed to the content of the meeting. The percentages in these tables are derived from the data in Tables 2 and 3; e.g. from

Table 2, Adrian’s 53 Design Value codes are 75.7% of the total 70 Design Value codes recorded in A1.

Table 4. A1, Category Contribution

	Adrian	Angela	Chris
Design Values	53 (75.7%)	16 (22.9%)	1 (1.4%)
Human Values	9 (37.5%)	15 (62.5%)	- (0%)
Narrative	26 (43.3%)	32 (53.3%)	2 (3.3%)
Requirements	13 (27.7%)	24 (51.1%)	10 (21.3%)
Process	15 (62.5%)	5 (20.8%)	4 (16.7%)

In Table 4, 75.7% of the Design Values came from Adrian, 22.9% from Angela and 1.4% from Chris. The Human Values in A1 come primarily from Angela at 62.5%. Adrian contributes 37.5% of the Human Values and nothing from Chris. These two results are consistent with notion that Adrian has the most to communicate about Design Values and Angela the most to say about Human Values.

Codes from the Narrative category are fairly evenly split between designer and client with Angela and Chris accounting for 56.6% together, and Adrian claiming the remaining 43.3%. Requirements were mostly driven by Angela (51.1%) and Chris (21.3%). The business of running the meeting, noted by Process, fell primarily to Adrian (62.5%).

During A1, the details of the design are still being refined. Adrian walks Angela and Chris through the design, and at each step the requirements are clarified and modifications are suggested. The discourse throughout A1 is a volley of values between architect and client where each is asserting, listening, and responding to statements of values from the other. The situation in A1 could be seen as a process of osmosis where higher concentrations of each category of value, design or human, begin to permeate a lower concentration of those values. This progression can be seen in Table 5 where Angela contributes more to the Design Value category (33.3%).

Adrian, however, ruins this tidy metaphor by not contributing anything to the Human Values category during A2. This result is surprising but may be explained by examining where in the design process meeting A2 took place. The amount of time that passes between A1 and A2 is significant at seven months, and by A2 the design process had marched considerably onward. The lack of Human Value statements from Adrian could indicate that his focus had moved to advancing the design toward planning. The big problems, with a few exceptions, had been solved and he no longer needs to synthesize new information about the design space.

Table 5. A2, Category Contribution

	Adrian	Angela	Chris
Design Values	31 (64.6%)	16 (33.3%)	1 (2.1%)
Human Values	- (0%)	11 (100%)	- (0%)
Narrative	22 (41.5%)	30 (56.6%)	1 (1.9%)
Requirements	6 (22.2%)	18 (66.7%)	3 (11.1%)
Process	16 (76.2%)	3 (14.3%)	2 (9.5%)

In examining the transfer of values between client and architect, we have said little about the contributions made by Chris, the second “client” present at the

meetings. Chris's role in the meetings was slightly different from Angela's. Through both meetings he typically let Angela lead the discourse, commenting only sparingly. His contributions came primarily in the form of Requirements or Process. He was specifically engaged in discussions about building features that were less well defined. One such instance occurs in A1 during the long discussion about the audio-visual system. Throughout this part of the design discourse, Chris presents functional requirements and is engaged in problem solving with Adrian:

Extract 4, A1, Example of Requirement, Activity

628	Chris	and the other bonus of them not being actually sitting in there was that
629		they could communicate then outside the other issue we looked at was
630		because this person erm [<i>begins to point</i>] also is monitoring in the ideal
631		world what's happening out here and what's happening out here so ah
632		they're not only dealing with this the current funeral but the previous one
633		and the one to come
634	Angela	see when they're arriving
635	Adrian	[<i>begins to sketch</i>] the answer is then to have a door there
636	Chris	a door
637	Adrian	maybe a window
638	Chris	a window
639	Adrian	and they can
640	Chris	and a window this way

The pattern of discourse is different in that a specific remedy that satisfies the requirement is not immediately apparent and so the discussion does not touch Human or Design Values much at all. This suggests that before the discussion of values occurs, the functional requirements of the building must be met, at least in part, so that the proposed solution can be judged against those values. The absence of statements of values during problem solving is consistent with the findings of Luck and McDonnell; in their investigation of architect and user interaction, discussions that occurred early in the process did not touch on phenomenological experiences but focused on the functional and structural needs of the design (Luck and McDonnell 2006).

3.1 The Mechanics of Value Transfer

Throughout both A1 and A2 a consistent discourse pattern emerges around value transfer. The pattern begins when a requirement is introduced. A value concept is then associated with the requirement and narrative elements support and further expound on the value.

At the end of this exchange, there is often some kind of affirmation of understanding. Adrian's affirmative response usually comes in the form of a specific change to the design which is consistent with ideas of how architects effectively communicate through drawing (Robbins 1994). Angela's response comes as a restatement of the idea.

Extract 5, A1, Example of value transfer discourse

1039	Adrian	well last time we spoke you thought it was comfortable to have a space
1040		like this because you said that there might be large families visiting
1041		wanting to arrange a funeral and if you couldn't get them into the office
1042		for that purpose you could bring them in here
1043	Angela	yes
1044	Adrian	so just like this space this space here would double up as a kitchenette
1045		staff room and meeting room for large meetings
1046	Angela	you'll be able to see like we can we can see the cremators from here

1047 at the moment which is always
1048 Adrian no you can't see them from here
1049 Angela no you can't see them so that's not a that's an issue yeah that's well
1050 some people you know
1051 Adrian don't want to see them
1052 Angela don't want to see it you know
1053 Adrian yes I can understand that
1054 Angela they also see that there's been you know we're sitting here chatting
1055 having tea coffee and lunch and that's so that's quite nice that you
1056 don't actually see it although you're near to it
1057 Adrian just like this room you get a view out over the gardens in this
1058 direction OK
1059 Angela OK
1060 Adrian and er the staff wing this area if you like has all the staff (support)
1061 accommodation they have their own disabled loo cleaners store
1062 shower changing area at the end here you have a (coat) store couple of
1063 ordinary loos and on the front of house the really posh bit you get
1064 lovely views from both the vestry and the office over the pond and you
1065 get a formal entrance lobby on this axis the vestry has its own WC so
1066 that the clergyman or priest whoever's taking the service can change
1067 and so on and so forth

Extract 5 starts with Adrian reasserting a requirement communicated to him previously (A1, 1039). Angela and Adrian then negotiate and agree on the Human Values present in the staff room (A1, 1046-1054). In this exchange both Angela and Adrian are synchronized in their understanding of the phenomenological experience of the space and they trade comments that support and validate the shared understanding. This can be seen in how Angela repeats or restates what Adrian says (A1, 1049; A1, 1052; A1, 1054).

Extract 6, A2, Example of problem solving discourse

448 Chris and I think you need an out-and-out office here
...omitted
464 Angela here ++ I mean we've got the bigger waiting room but the vestry we
465 we felt had to be this size for some reason we just felt it was rather
466 than coming all the way through here ...
...omitted
469 Angela they'll say first thing they'll say when we get the consultation is they
470 don't want to be over there walking across the water or coming in
471 through this way they would probably prefer to be around this edge
472 where the the ordinary people are so they can mingle with the people
473 sort of here before the service starts
...omitted
501 Angela but I j- I just have a feeling that they will not they will feel although
502 there's the reasons why tha- that's quite a good idea I think they will
503 feel too far away from the arrival of the cortege and the people
504 milling around I think that would be one of the things they will say
505 +++++ I would think they would feel that they were sort of out of the
506 way a bit and they'd like to sort of be hanging around here especially
507 if this is now covered and especially if they're sort of sitting in there
508 they can see that's such a nice idea they don't have to move +++
...omitted
529 Angela I'm not too sure that I wanted it over there and I don't think they
530 would perhaps want it over there either but down here that's quite a
531 nice idea I quite like that if that's possible
532 Adrian yeah that would make it very similar to the existing building

Extract 6 highlights segments from a longer section of discourse. This discourse walks through a requirement tabled by Chris regarding the need for office space and its relationship to the vestry (A2, 448). The functional requirement is followed by a number of comments, mostly from Angela, describing the needs of the minister or officiant and how they would feel in the space along with ways that would enable them to provide the best support for people arriving and waiting for the service to start (A2, 464; A2, 469; A2, 502). Angela's comments and narrative describe the human elements of the activity adding necessary details so Adrian can accurately judge what an appropriate solution might be. Adrian closes this segment by agreeing to the change and asserting a Design Value of form, which communicates back to Angela and Chris a comparison to the current building that helps them judge the appropriateness of the change.

3.2 Evidence of Mutual Understanding

During A1 when Angela is contributing Design Values, they are usually in deference to Adrian. Her concerns are about the uniqueness of the project and specifically the purity of final form but she defers to Adrian's judgement as to what the right design choice should be:

Extract 7, A1, Example of Design Value - Angela's deference to Adrian

816	Angela	OK is that too heartbreaking for you [<i>all laugh</i>]
817	Adrian	well it's not as pure a summation as I was looking for but I mean
818		maybe there's another way of doing it maybe if I keep my thinking cap
819		on because you can see I'm trying to keep the spaces pure the
820		purier the space the more spiritual I think it will be the more you mess
821		around with it

In Extract 7 Angela is concerned what impact some required changes would have on the overall design (A1, 816). The joke and nervous laughter belie her desire for a coherent design even as she is unsure how to achieve it.

By A2 Angela asserts Design Values in a more confident manner, indicating her comfort with those values:

Extract 8, A2, Example of Design Value - Angela's stronger expression of form

803	Angela	will that be coloured? or will it be-
804	Adrian	could be if you wanted it I hadn't thought of that but if that was
805		something you you'd er be interested in us looking at we could do that
806	Angela	mood lighting I think they call it don't they?++
	...omitted	
813	Angela	as well.I was looking at something for stained glass or
814	Adrian	yes no
815	Angela	something that was sort of
816	Adrian	we're with you one hundred percent I think /we we\-
817	Angela	/the sun\ comes up this way and sets sets this way so it would be sort
818		of erm that would be you know quite nice to do but then I mean that
819		obviously adds more expense
	...omitted	
825	Angela	so we're of thinking something like COVENTRY CATHEDRAL
826	Adrian	yes
827	Angela	you know with that sort of effect in a way more
828	Adrian	yes
829	Angela	and EDINBURGH's got sort of quite similar erm sort of ss- ss- streaks of
830		light coming through erm and that was the sort of- not that- this is sort

831 of slightly bigger but you know something + in a sense that has some
832 sort of feel of sort big- of something attractive I mean thinking of that
833 but obviously that would add extra expense

The design discourse excerpted in Extract 8 shows Angela expressing aesthetic Design Values. She begins by expressing a goal for creating a certain phenomenological experience (A2, 803; A2 806) and has a specific idea of how the design can meet that goal (A2, 825; A2 829).

4. Discussion

Through our analysis of the two architecture design meetings, we have identified an important pattern of discourse during the communication of values between designer and client. The core component of the discourse is the functional requirement the design must satisfy. This requirement is reified through the application of values. Those values, in turn, are supported through narration and supporting details that make up a mechanism for capturing and assessing the designed artifact against those values.

Through the interplay of this pattern, participants consider and exchange information about the design space and the users who will inhabit it. It is during this exchange that value transfer takes place. The transformation is apparent from A1 to A2 through examining the contributions made by designer and client. In A1, while the design was still under revision and the details supporting each requirement were still unclear, the transfer of values was in full swing. The designer contributed Design Values to which the client responded and the client contributed Human Values to which the designer responded. By A2, the content of the meeting was largely a review of an advanced revision of the design. At this time, the client has a larger contribution of Design Values, which underscores the notion that a transfer has taken place and that a new set of values have been internalized to some degree.

On the other side, the designer's lack of contribution to Human Values in A2 is harder to explain. This may be a characteristic of the stage of the design process each meeting took place –in A1 the Human Value statements made by the designer could have been confirmations of understanding while in A2 no such confirmation was necessary as the design had matured past the need to synthesize new information. Further investigation that includes earlier meetings in the design process would help clarify this relationship.

As designers of all disciplines continue on the path toward co-design it is important to examine how different domains accommodate values in the design process so that those same values may be present in the final artifact. Our analysis provides an observational basis for examining designer-client interactions and an early attempt at a framework for comparing design discourse across multiple domains.

References

- Blythe, M. and Monk, A.** (2002) Notes towards an ethnography of domestic technology, *Proceedings of the conference on Designing interactive systems: processes, practices, methods, and techniques*, London, England, ACM Press, pp 277-281.
- Brereton, M. F., Cannon, D. M., Mabogunje, A., et al.** (1996) Collaboration in Design Teams: How Social Interaction Shapes the Product, Cross, N., Christiaans, H. and Dorst, K., *Analyzing Design Activity*, John Wiley and Sons, pp 319-341.
- Cross, N. and Cross, A. C.** (1996) Observations of Teamwork and Social Process in Design, Cross, N., Christiaans, H. and Dorst, K., *Analyzing Design Activity*, John Wiley and Sons, pp 291-318.

Frascara, J. (1995) Graphic Design: Fine Art or Social Science, Margolin, V. and Buchanan, R., *The Idea of Design*, MIT Press, pp 44-55.

Friedman, B. (1996) Value-sensitive design, *interactions*, 3 (6), pp 16-23.

Friedman, B. and Peter H. Kahn, J. (2003) Human values, ethics, and design, *The human-computer interaction handbook: fundamentals, evolving technologies and emerging applications*, Mahwah, NJ, USA, Lawrence Erlbaum Associates, Inc., pp 1177-1201.

Gaver, W. W., Dunne, T. and Pacenti, E. (1999) Design: Cultural probes, *interactions*, 6 (1), pp 21-29.

Lawson, B. (1990) *How Designers Think*, Butterworth, London, UK.

Luck, R. and McDonnell, J. (2006) Architect and user interaction: the spoken representation of form and functional meaning in early design conversations, *Design Studies*, 27 (2), pp 141-166.

Miles, M. B. and Huberman, A. M. (1994) *Qualitative Data Analysis: an expanded sourcebook*, Sage Publications, London.

Pollio, V. (1914) *Vitruvius, the Ten Books on Architecture*, Harvard University Press.

Radcliffe, D. F. (1996) Concurrency of Actions, Ideas and Knowledge Displays within a Design Team, Cross, N., Christiaans, H. and Dorst, K., *Analyzing Design Activity*, John Wiley and Sones, pp 343-364.

Robbins, E. (1994) *Why Architects Draw*, MIT Press, Cambridge, Mass.

Rowe, P. G. (1995) *Design Thinking*, MIT Press, Cambridge, Mass.

Sanders, E. B.-N. (2005) Information, Inspiration and Co-creation, *6th International Conference of the European Academy of Design*, University of Arts, Bremen, Germany.

Sanders, E. B.-N. (2006) Design Research in 2006, *Design Research Quarterly*, 1 (1), pp 1-8.

Sanoff, H. (1973) *Integrating User Needs in Environmental Design*, North Carolina State University, Raleigh.

Strauss, A. and Corbin, J. (1998) *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*, Sage Publications, London.

Suchman, L. (1997) Do categories have politics? The language/action perspective reconsidered, *Human values and the design of computer technology*, Stanford, CA, USA, Center for the Study of Language and Information, pp 91-106.

Tyler, A. C. (1995) Shaping Belief: The Role of Audience in Visual Communication, Margolin, V. and Buchanan, R., *The Idea of Design*, Cambridge, Mass., MIT Press, pp 104-112.

Williams, R. and Edge, D. (1996) The social shaping of technology, *Research Policy*, 25 (6), pp 865-899.