Information design:
how the disciplines work together

Rob Waller   *August 1995, reprinted March 2011*

Students on our courses are given concepts, in simplified form, from a wide range of disciplines such as cognitive psychology, discourse linguistics, sociolinguistics, and philosophy of language.

When we designed the programme, which is outlined in Technical Paper 12, we debated which academic disciplines would be most relevant, and we were aware that our simple summaries were not fully explaining the theories, but just co-opting them as tools for designers to use – sources of empathy about their audiences.

This conference paper is quite old now, but was never published – it discusses the relationship between academic disciplines and design. And it reflects on the kinds of knowledge used in design processes.

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Introduction

I have been asked to contribute my thoughts on how different disciplines can successfully work together in the practical context of an information design team.

For some years, there have been interdisciplinary discussions, particularly between designers and psychologists. It would therefore be nice to report that we now have a widely agreed upon body of knowledge, and a large number of truly interdisciplinary teams at work. This is not yet the case. I will consider some reasons for this and suggest some ways forward.

An inherently multidisciplinary area

Historically, information design as a self-consciously named activity has been essentially multi-disciplinary. When *Information Design Journal* was launched in the UK in the late 70s, the term was deliberately employed to divert graphic designers away from a simple concentration on graphic issues, and see design processes – that is, planning processes – applied to all aspects of information, including its content and language. The activity was not invented for the first time at that point – it was merely an attempt to rally the various activists under a single banner.

Fifteen years on, the term 'information design' is beginning to be used quite widely – the IIID, the Information Design Association in the UK and now the USA, are testimony to that. There is, then, a growing number of professionals, researcher and educators who see information design as their home.

The first editorial board was designed to represent the range of disciplines it was thought might contribute. It included applied psychologists (several, representing different interests), linguistics, interface design, journalism, educational technology (in the sense of pedagogy rather than machines), design history and graphic design. We also included practising information designers as well as academics.

Table 1 is one way of characterising some of the disciplines information designers have worked with or turned to as a source of theoretical grounding.

Specialism	Problem addressed
Graphic design	*It looks awful*
Design history	*It looks like nothing they've seen before*
Marketing	*They don't want it*
Market research	*I don't know who they are*
Psychology of perception	*They can't see it*
Cognitive psychology	*They don't understand it*
Applied psychology	*They can't use it*
Text linguistics	*They don't understand the argument*
Sociolinguistics	*They don't think you are talking to them*
Clear writing/rhetoric	*They don't understand the words*
Journalism	*It is boring*
Information science/management	*It doesn't tell them what they need to know*
Information technology	*They can't open the file*
Interface design/HCI	*They can't find their way around*

Table 1: why information designers might turn to sources of theory to solve practical problems.

Why do we see information design as multi-disciplinary? The alternative would be to simply grow our own techniques and standards, and ignore other disciplines.

The answer lies in our relationship with our audience.

With face-to-face communication, we get instant and instinctive feedback – we continually adjust our presentation as we perceive looks of incomprehension, interest, laughter or whatever from our audience. (This is one reason why reading a written paper at a conference is less than ideal, although considerate to our interpreter – it means speakers are denied this advantage.)

With written communication there is a feedback gap between reader and writer. The communication is indirect. Apart from the difficulty in finding out what they think, by the time the reader gets the information, too much has been invested in its production to be able to change it.

All efforts to use research in the design process are aimed at bridging this feedback gap. For example, we hope that psychologists can provide techniques for measuring reader's responses, and theories from which to extrapolate this to new situations. We hope that linguistics can give us a systematic descriptive framework. In effect, we hope to more accurately imagine the readers we are talking to.

I am not actually suggesting that information designers need to completely master all of the disciplines listed. But I believe they do need some exposure to them as part of their training, and they also need access to their core principles and techniques during their working lives – either through accessible information sources, or through expert colleagues. Table 2 is an attempt to map which disciplines are most critical to good information design practice. Some are central to the designer's education; some will be shared or found in team members they work with; some they will need to research from time to time as questions arise.

	Knowledge gained from designer's education	Consult literature to gain knowledge when needed	Working with expert team members
Graphic design	Critical	Less important	
Clear writing/rhetoric	Critical	Less important	
Interface design/HCI	Critical	Critical	Critical
Information technology	Fairly important	Less important	Critical
Design history	Fairly important	Less important	
Marketing	Fairly important	Less important	Less important
Market research	Less important	Less important	Fairly important
Cognitive psychology	Less important	Fairly important	
Applied psychology	Less important	Fairly important	
Journalism	Less important		Fairly important
Information science/ management	Less important	Less important	
Psychology of perception	Fairly important		
Sociolinguistics	Less important		
Text linguistics	Less important		

■ Critical

■ Fairly important

■ Less important

Interdisciplinary working: the reality

Linguistics

One of the most fundamental things any field of research or practice needs is a descriptive framework. That is, before embarking on specific experiments on information design artefacts it would seem necessary to agree on what the constituent parts are, so we can discuss them and specify them. When psychologists started researching the comprehension of text, for example, they implicitly relied on a tradition of grammatical analysis which identified units of discourse such as word, phrases, sentences and paragraphs. As research on text developed the psychologists became more aware that these issues were themselves subject to debate, and the interdisciplinary field of discourse studies now includes researchers from both linguistic and psychological backgrounds.

This cannot be said of the typographic and layout issues that are at the heart of much information design. Although they are clearly qualities of written language, they have been almost entirely ignored by linguists.

Most linguistics textbooks start by acknowledging that there are two modes of language, spoken and written. They claim that spoken language is covered by phonology and phonetics, and written language by graphology and graphetics (the -ology and -etics suffixes denote different levels of analysis). They then go on to discuss phonology and phonetics in great depth and mysteriously forget to return to written language. A keyword search of the literature show many thousands of papers on phonology and just a handful on graphology. It is in fact a virtually empty category in linguistics.

There are a number of reasons for this, which we do not have time to go into now, but they are essentially that the early pioneers of linguistics saw writing as merely a transcription of speech. A further motivating force behind American linguistics was the need to transcribe Native American languages which were dying out – clearly the pressing requirement there was to study spoken language. Moreover, the early pioneers started with the sentence as their unit of analysis, and somehow never went beyond it.

Even those linguists who go beyond the sentence – those working in text linguistics, stylistics and discourse analysis – rarely notice typography or layout factors. There are a number of exceptions, of course, but the body of work is still small and unrefined by debate.

Moreover, I cannot think of any connections made between the analytical frameworks that have been proposed for information design within text linguistics and the studies performed by applied psychologists, the next discipline I will consider.

Applied psychology

The history of designers and applied psychologists cooperating is quite an old one. Although there were some lamentable exceptions, many researchers have involved typographers in the course of their work.

For example in the UK (and please forgive my ignorance of work that may have taken place in the German-speaking world) the prominent psychologist Sir Cyril Burt (1959) consulted the famous typographer Stanley Morison in the early 1950s. There were notable interdisciplinary teams established in the 1960s and 1970s (such as psychologist James Hartley and designer Peter Burnhill, and Herbert Spencer's group at the Royal College of Art in London), and my first home, the Textual Communication Research Group at the Open University.

The existence of such teams, the interdisciplinary journals, including *Visible Language* and *Information Design Journal*, and various conferences, would suggest that by now we would have a satisfactory knowledge base for the practice of information design. However, this is not widely regarded as the case.

The reality is that there is a quite substantial literature, but considerable confusion about its quality and applicability to design tasks.

What are the reasons for this?

Incompatible paradigms

The experience of multidisciplinary conferences is frequently one of mutual incomprehension. Designers are frequently appalled by the poor standard of stimulus material used by psychologists, while psychologists are frustrated by designers' lack of a theoretical framework, their lack of evidence, and their apparent unwillingness or inability to articulate their processes. Conferences sometimes develop side-themes in which the role of research and designers' methods (or lack of them) are debated and challenged.

The problem is that each discipline may have a coherent paradigm – a world view, a set of problem-solving techniques, a body of knowledge – but they seem incompatible with each other.

I'll illustrate this with two examples from an excellent conference held in the Netherlands last year – two of the organisers and several participants are here.[1]

Mijksenaar: stunning design, but no explicit theory

Paul Mijksenaar, the well-known Dutch designer, presented a visually stunning set of slides on his signing system for Schipol Airport. This signing system is highly regarded in the design world, and my personal experience of it is that it works well. In his talk he promoted the concept of 'visual quality' but was challenged by psychologists in the audience to give evidence for the effectiveness of his signing, and to define visual quality.

A designer's response to this might be: what exactly would count as evidence? For example, would you want to test the comprehension of each sign in its actual context, with a representative sample of every kind of passenger? Such an exercise would actually be no different from actually installing the entire signing system and then waiting for errors and complaints – which is how things are normally done.

The Schipol signing system is not arbitrary – like any good signing system it relies on a deep understanding of how people use environments. It is a holistic solution with its own internal logic which may be perceived by both the designer and the users, without necessarily being articulated.

The applied psychologist: thorough research but no design process

A counter-example was a study presented by two applied psychologists, leading experts in the design of warning labels, who have published a huge amount valuable and perceptive research.[2]

They addressed a practical problem experienced by the car battery industry. Every year a significant number of people are injured because they jump-start a flat battery incorrectly. Most of us think that you connect both ends of each cable to the equivalent terminal of the batteries. That is, you connect the positive terminals of the dead and live batteries to each other and likewise the negative terminals. Apparently this is wrong – we should connect the negative terminal of the dead battery end to the engine block as an earth (ground in US English) connection.

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1 The conference was Public Graphics, Lunteren, 1994, eventually published in Zwaga (1998).

2 I am leaving them unidentified here.

The existing warning and instruction tag is printed in very small type with no illustration. The researchers redesigned it in graphic form and tested it. The results were impressive – 26.5% of people who received the label passed a comprehension test, while 0% of people not exposed to the label did so.

They went on to test the ecological validity of this finding – to see if it survived in a real situation, in a workshop with real cars and real batteries. Again, the results were impressive – 50% to 0%.

In they discussion, the researchers commented that the results were still quite low in safety terms, and speculated on how they might be improved. They had various ideas, including the thought that perhaps an audio or video tape would be good. The designers in the audience, who had been privately aghast at the quality of the stimulus material, thought 'Yes, sure, when you leave your lights on and the battery is flat, the first thing you do is look for a VCR'. This suggestion does not give great confidence in the researchers' empathy with their audience.

The psychologists concluded with the thought that perhaps it would be a good idea to put labels on each end of each cable, saying, for example, 'attach this end on the positive terminal of the live battery', or 'attach this to the engine block of the dead battery car'.

At this, the designers in the audience thought 'YES!'.

What we are seeing here is not so much an experiment that tests a theory as part of a generalisable body of knowledge, as a design process intended to solve a very specific problem – a design process that happens to be conducted by a psychologist rather than a designer. Yet because the psychologist's core activity is running tests, that part of the design process dominated.

A long time ago, in 1976, my colleague Michael Macdonald-Ross and I published a paper addressing precisely this issue. We called it 'Criticism, alternatives and tests', arguing that empirical research on practical design issues needs to take place only within a context that includes, firstly, the application of a critical tradition and process, and, secondly, the generation of design alternatives by a skilled designer. Only by using this combination of explicit analysis and tacit synthesis of the solutions will you have candidate solutions worth testing. If the jump leads study had been done this way around, I believe they would have shown much greater success – perhaps even 100%.

But perhaps I should run a test to prove it...

Different kinds of knowledge

What underlies this apparent incompatibility of psychology and design is a fundamental difference in the kind of knowledge they employ.

Scientists are committed to building explicit knowledge that is public and accountable. Designers are committed to building tacit knowledge that is private and unarticulated. Explicit knowledge is taught by explaining. Tacit knowledge is taught by showing, and learned by doing.

The scientific commitment to explicit knowledge is exemplified by the introduction to a book entitled 'The technology of text' (Jonassen, 1982). In attempting to delineate a scientific approach to text design. Jonassen declares it as:

> 'a counterpoint to the artistic and unsystematic approach to text design and layout that has prevailed since petroglyphs were first inscribed on walls'.

It is very common in the research on educational psychology to encounter this staggeringly naive view of what counts as knowledge. In Waller (1987: 73) I commented that:

> "In effect, a game is being played where a new 'fact' is admitted to the circle of those playing only when an experiment has appeared in the literature to support it. No other knowledge counts. The game is played in code: 'nothing is known about...' or 'we do not know…' means 'no one has published an experiment about…'. My mind seized up for a few seconds when I encountered the following conclusion to a recent review of classifications of research questions: 'On the whole, little is known about the kinds of questions that may be posed for research'."

Criticisms like this are not just made by designers like me. Philosophers of science and researchers themselves are frequently critical of the misplaced rush to experiment. I have found the philosopher of science Jerry Ravetz (1971) particularly useful here: he warns that for immature disciplines – and nothing could be more immature as a discipline than information design – to assume the outward pretence of the positive sciences with elaborate methodologies means that their theories and symbolic systems become grotesque parodies of the realities they claim to describe.

And here is a quote from Brumfit's (1980) description of the interdisciplinary problems faced by applied linguistics:

> '…a great deal of harm has been done by the enthusiasm of practitioners for inappropriate statistically-based experimental work, when discussion of a synthetic rather than analytic nature may have much greater value: there are academic dangers in formalism and practical risks in the adoption of inappropriate ritual.'

Lest I seem to be unduly critical of the scientists, let me redress the balance by thinking about designers for a moment. Here the problem is the converse – not enough analysis. Our profession is dominated by an aesthetic bias that needs examining. I am careful to say 'examining' and not 'condemning' because it is a subtle issue.
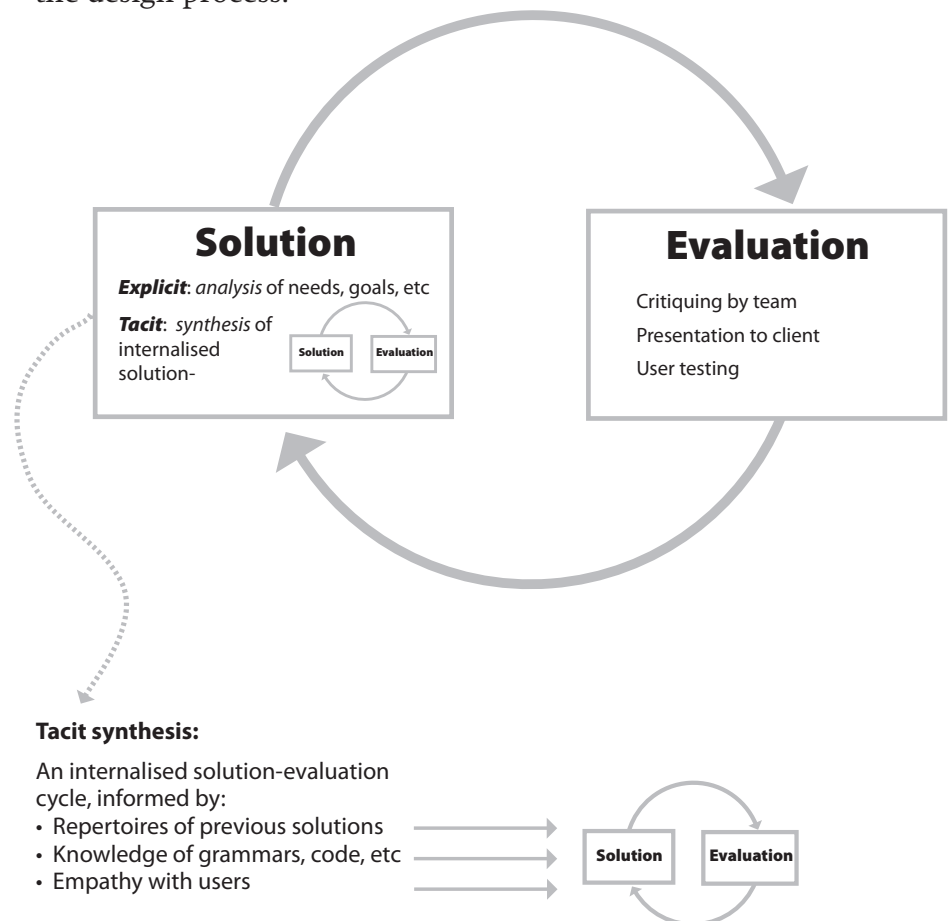
Designers earn their living by making things look nice. Whatever we say about making them function well, if they do not look nice we are seen to fail. Engineers can make things work, but designers are chiefly employed by clients who also wish their products to be visually appealing. Students are evaluated and eventually employed on the strength of portfolios of work, prizes are awarded and reputations built on projects that result in illustrations that look good in design magazines.

The long-standing slogan 'form follows function' has always seemed to me to reflect a philosophy that is far from functional. Good form is expressly the goal here; it is merely said to follow from functional design (often seen in terms of the integrity of materials and manufacturing processes, as much as functionality in use). If we were to say instead 'Function follows form', we would redirect our effort into producing design that values good form only in so far as it enhances functionality. This is not to decry the aesthetic balance of a good design solution, but to harness the aesthetic perceptions that designers are so good at making – which are holistic, intuitively judged, and based on tacit knowledge – to the cause of functional effectiveness.

I don't want to pursue this issue too far today – David Sless has already interestingly addressed what he called the moral-aesthetic dimension (see Sless 1996 for a version of this concept) – but I want to just note one interesting connection with the world of the scientist. Michael Polanyi, the philosopher of science associated with the concept of tacit knowledge, quoted the use of the term 'aesthetic recognition' by a biologist who noted that the normal taxonomic approach to species recognition did not work well in the field. His research focused on a particular species of worm, and when collecting specimens with his students he found that taxonomic checklists were too cumbersome – for example, students would have to check that there were so many rings, such and such a length and colour and so on. Instead, he found that if he said 'bring me any worms that sneer at you', the students were successful. He had found a way of describing the holistic quality that he as an expert actually used when recognising the species.

Polanyi describes the qualities perceived by aesthetic recognition as 'physiognomic'. The metaphor is that of the human face, which we can easily identify without being able to articulate. He argues that defining a physiognomy will involve two stages: a focal awareness of its particular features, and a subsidiary awareness of those particulars in relation to the whole. He uses a series of examples from real life as well as science to argue that most 'knowing' involves an alternation of focal and subsidiary awareness – of analysis and synthesis, if you like. This corresponds in some ways to the model we discussed before of explicit design processes of analysis and criticism alternating with the tacit generation of alternative solutions.

This diagram suggests how tacit and explicit thinking combine in the design process.

Solution

Explicit: *analysis* of needs, goals, etc

Tacit: *synthesis* of internalised solution-

Solution   Evaluation

Evaluation

Critiquing by team
Presentation to client
User testing

Tacit synthesis:

An internalised solution-evaluation cycle, informed by:
• Repertoires of previous solutions
• Knowledge of grammars, code, etc
• Empathy with users

Solution   Evaluation

Designers alternate between creative and evaluative phases – even at the most simple level, we draw a line, then consider whether it is in the right place before moving on to the next one. At a higher level, evaluation is a distinct stage at which we show it to colleagues, clients or users, or we come back to it ourselves after a period of reflection in which we can become distanced and therefore more objective about our own work.

I believe this solution-evaluation cycle goes on all the time, silently as we work – in other words, during what appears outwardly to be the solution stage (the designer is working individually by himself or herself), internalised solution-evaluation cycles are happening inside the designer's head. Both the solutions and evaluations are informed by the designer's knowledge, experience and empathy.

The internal evaluation cycle does not mean designers do not need externalised public evaluations. Unless moderated by an explicit critical process, designers' internal critical filters can be easily deceived by what we might term 'aesthetic fallacies' – false symmetries and alignments, for example, or oversatisfaction with a layout that simply looks appealing.

Time, money and clients

Deadlines and budgets

Note that I have included the client in the solution-evaluation cycle, reflecting the reality of designers' lives. Commercial realities are a major constraint that affects interdisciplinary working in practice.

In our company[3] we take on research projects for clients which may lead to no product other than the research results, or a set of guidelines. We sometimes ask why they chose us, and among the reasons they give is – 'well, we would normally go to a university for this, but they would take a year, and might change the brief if it seemed more interesting to do it another way'.

This is not to criticise universities – as I see it, it is their job to take research wherever it leads and for however long it takes. But it highlights how dependent designers are on their clients. Well known and successful designers can and do walk away from jobs for clients they don't think they can work with. But most are torn between pride and hunger.

Both deadlines and budgets are frequently very tight for designers, and it is simply not possible to do all projects in an ideal way. For example, designers of user guides will tell you that very often the product is not actually available to them while they are designing the guide. Furthermore, no one appears to know exactly how it will work. So for us to be sure we are writing the correct guidance, and to user-test our design for a payphone user notice, for example, we must wait until the last possible minute. Any testing we do is

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3 The company referred to is Information Design Unit.

necessarily with a limited number of people, and is not scientifically controlled – but we think it is better than nothing.

The client: the errant photon

Whenever I see a designer winning a prize for an outstanding and bold piece of design, I think the client should be awarded a prize as well – for backing the designer, defending the concept, sometimes taking a risk. Every designer tells of work ruined by unprofessional and imperceptive clients.

My colleague David Lewis and I recently presented a paper[4] in which we likened the design process to a lens that takes parallel beams of light (the apparently incompatible goals and constraints contained in every design brief) and focuses them so that they meet at a focal point (the ideal design solution).

Marketing
Brand
Product
Customer services
Legal
Operations
Retail
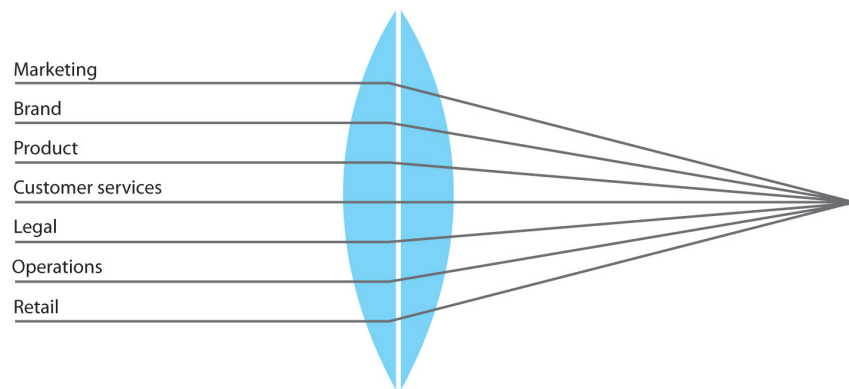
In practice, the brief frequently changes after this point, with the effect that the final outcome is out of focus and blurred. By that time, you are committed to the former focal point, and an imperfect result is produced. In practice designers sometimes lament that the perfectly focused solution is often the penultimate version, not the blurred one that is published.

Marketing
Brand
Product
Customer services
Legal
Operations
Retail

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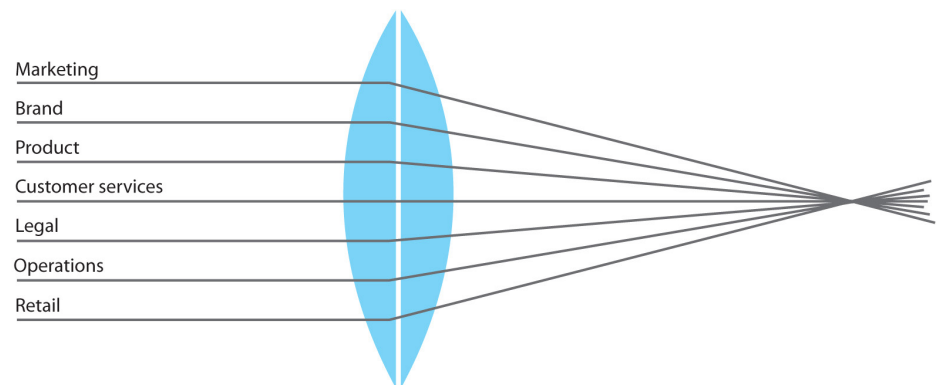
4 The paper was presented at a conference organised by PIRA, the printing industry research centre (title and date lost).

And I read somewhere that physicists can identify stray photons that take a random and unpredictable path – in design, this is what happens when the CEO sees the work and changes the colour.
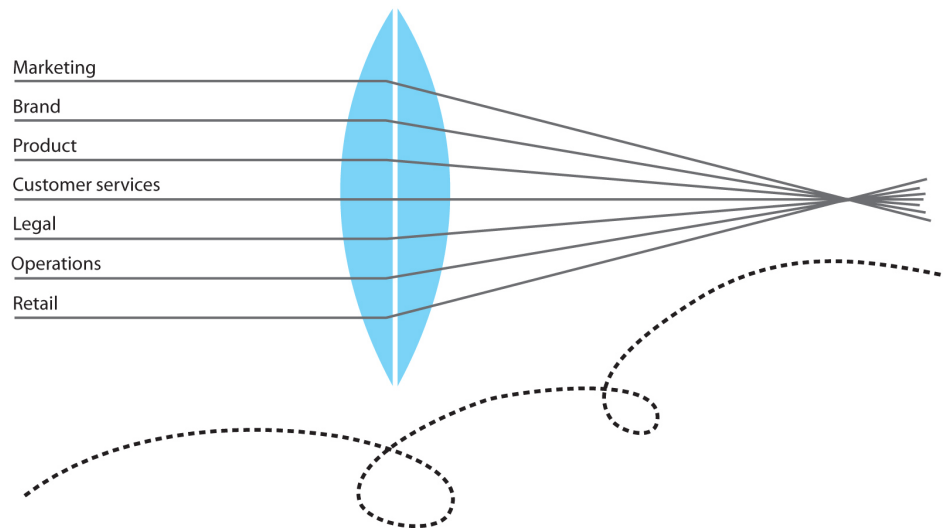
Possible ways forward

I want to conclude by pointing to some ways in which information design might develop more effective practices for using the skills and techniques from different disciplines.

Problem-oriented theories

Firstly, I would like to see theories that build on and feed into the tacit knowledge of skilled designers. I use the word 'theory' loosely here to mean any kind of articulation of the process of creating or using information.

A critical tradition for design, accessible by both designers and researcher, must be sensitive to the full range of contextual and reader-related issues found in practical situations. In my 1987 doctoral thesis I argued that these can be seen as embodied in the notion of genre or text type. These are ordinary language categories which we apply to documents such as 'leaflet', 'report', 'poster' etc. Such descriptions embody assumptions shared by writer and reader alike about appropriate ways to present and read such documents – a thought that might be controversial in literature but perhaps simply reassuring in the context of functional communication.

Analysis of the characteristic content, form and reader-behaviour for different genres might provide a firmer context for conducting, interpreting and applying research.

As a practical contribution to this, a case clearing house for design educators and researchers would give us a shared experience of specific situations. Business schools frequently use the case study method, relying on the Harvard Business School Case Clearing House, and equivalent institutions, to make case histories available for educators and build a shared body of experience among managers.

Most craft-based skills depend on the ability to recognise bad practice in order to correct it before it is to late. We need a critical tradition that would provide not just models to copy, but a pathology of design – a way to diagnose errors in order to correct them.

Tools

Again using management as a model, we might see the object of research, in so far as it wishes to influence practice, as the production of practical tools for designers to apply.

When we use research in our own design practice, we borrow or invent techniques to address highly specific situations. They include:

- focus groups
- preferences and ranking tasks
- role playing
- performance tasks

Some researchers have addressed the issue of tools explicitly, although the results are controversial. Readability formulae are the best known example, and there have been attempts to apply the technique to other aspects of layout and content (Bonsiepe 1968, Meyer & Rice 1989).

As an example of how research can be turned into a simple tool, we developed a simple informal legibility test for designers at one of our clients. They wish to ensure that publications can be read by older people, a large number of whom have some visual impairment. We related the results from legibility tests to a simple tool – a piece of paper of a specified brand – which designers can place over their proof. If they can read the type through the piece of paper, it will also be legible to their target audience. We are calling this the Strudel Test (David Lewis's mother would apparently say you can tell your strudel pastry is thin enough if you can read a newspaper through it).

Team and project structures

We have also experimented with different team structures in order to improve the performance of design. This may involve role playing of various kinds or a new delineation of responsibility. For example we have used a questionnaire-based approach to help technical experts write for special audiences. Technical experts write author-centred prose, and have difficulty in transforming their ideas into forms that distant audiences can understand. We have been experimenting with questionnaires that focus them on the audience's priorities, in an attempt to reveal to them the real nature of the conversation they are engaged in.

I used the word 'transforming' just now deliberately, in an acknowledgement of the great Austrian pioneer of information design Otto Neurath. His Isotype Institute, starting in Vienna in the 1920s and operating at later dates in Moscow, London, and other places, developed revolutionary graphic techniques for communication what he called 'social facts'. In doing so, he found that experts could not easily visualise good graphic solutions and graphic artists could not easily understand the experts. He therefore developed a specialist role that has been translated into English as 'the transformer' – an expert in effective communication who acted as the representative of the reader. The transformer role is one that as researchers we should seek to inform, and that as information designers we should seek to fulfil.

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