What is information design?

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Information design is about managing the relationship between people and information so that the information is accessible and usable by people.

40,000 years of practice

Designing artefacts whose principle purpose is to make information accessible and usable appears to have been going on for a long time, and we need to place our current interest in this area within that perspective.

Some of the earliest fragments of human society, dating back 40,000 years, are animal bones on which are etched what scholars believe to be a lunar calendar (Marshack, 1972).

Figure 1

Information design from 40,000 years ago. Drawing of the engraved and shaped bone plaque from the Abri Lartet in the Dordogne, France.
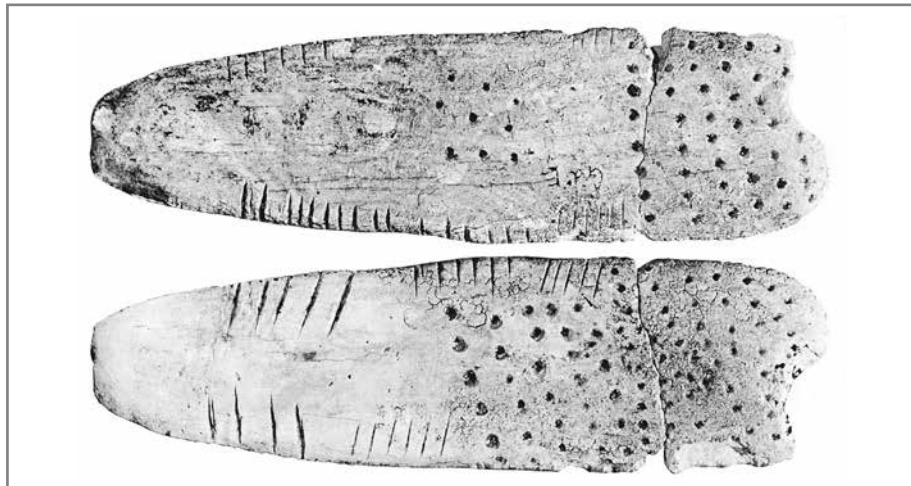
If the last 40,000 years were one year, the widespread use of computers occurred just one hour before midnight on December the 31st. Our knowledge gained through research in recent years is but a small contribution to the wisdom of accumulated practice over centuries.

16th Century multimedia for anatomy students

In this brief glimpse of our history, I could have chosen many examples. But I have chosen one that illustrates three major themes: firstly the centrality of information design in the growth of knowledge, secondly the extraordinary depth of experience on which contemporary information designers can draw, and thirdly the political dimension of information design that is a perennial feature of our work.

In 16th century Italy anatomy was taught from a single book consisting entirely of text with no illustrations, written many centuries earlier by the Greek scholar Galen. Galen's book was the authority, the law. In anatomy classes, the teacher

Figure 2

One of the three illustrations of the human skeleton form from the *Tabulae Sex,* Andreas Vesalius, 1538.

would sit on a high chair and recite the book to students. The daunting task facing students was to memorise all the parts, in most cases without examining an actual body, since dissection was prohibited except for forensic purposes.

Into this world of classical dogma erupted the invention of perspective and life drawing—the virtual reality of the Renaissance.

The information that the drawing opposite made accessible and usable is not, as our modern eye would see it, the detailed appearance of a human skeleton. Rather it was designed to help students memorise and then recite, parrot fashion, the parts of the body as described by Galen. The students of the day would have been horrified to discover that these drawings came from the detailed observation of actual cadavers, illegally and secretly removed from the gallows in the dead of night, rendered down to remove sinew and flesh, and then carefully assembled into a skeleton. The students' task was to remember Galen, not the appearance of bodies.

Natural skeletons, without tissue and muscle, collapse into their component parts and have to be reassembled to give a picture of the whole. Vesalius created drawings of reassembled skeletons to make Galen's badly written text accessible and usable to students, a classic case of information design making impenetrable law accessible. The field may be anatomy, but there is a link across the centuries between Vesalius and those of us today who try and make difficult laws and ideas intelligible to people.

The link is not just one of purpose. Politics, then as now, played its part. Vesalius discovered, in his attempt to faithfully translate Galen's words into illustrations, discrepancies between Galen's descriptions of the parts and their actual appearance. He realised that some anatomical features described by Galen were present in pigs and dogs, but not humans. Because of the politics of his time, Vesalius never voiced his concerns—namely that Galen had dissected pigs and
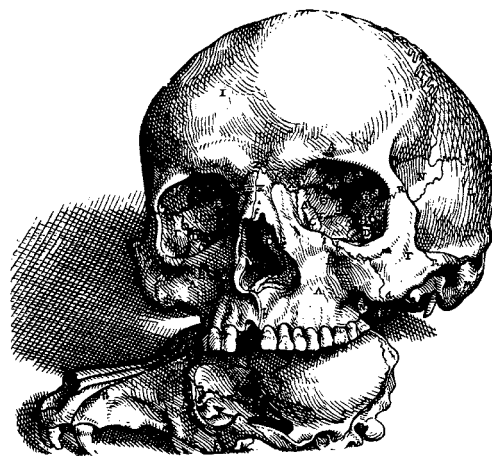
Figure 3

'We have placed the skull of a dog beneath that of a man so that anyone may understand Galen's description of the parts', Andreas Vesalius, from the first book of *De Humani Corporis Fabrica,* 1543.

dogs though generations of teachers and students had learnt to recite these parts thinking they were human. Instead he produced the illustration on the previous page in which he showed the upper jaw of a dog and human juxtaposed. Vesalius never actually said Galen was wrong; indeed he could not do so without risking his work and his life.

Those of us who have discovered the gaping holes in legislation when we try and make it clearer, or the failures of computer systems to take account of people when we try to create usable interfaces or documentation, feel an affinity with Vesalius across the centuries.

Vesalius stood at an important moment in history, a moment of fracture between the classical world view, based on dogma and authority, and the modern world view, based on observation and science. We suspect that Vesalius understood this since he used the above illustration, without comment, as a frontispiece for all his major works on anatomy.

There are many other examples where information design attended the birth of modern science. Whether it did so as midwife, mother, or child may yet be a subject for historical dispute, but there is no doubt that information design is a central aspect of our civilisation. Many discoveries and inventions have occurred in the past and will do so in the future because somebody decided to make information more accessible and usable to others.

Most of our work as information designers, in our time, is concerned with the prosaic aspects of daily life rather than great moments in history. But it is possible to see our work as part of that grander tradition.

Ancient craft to post-modern process

A thumb-nail sketch of the historical transitions that our craft has gone through provides some useful insights on the contemporary issues that face us in trying to achieve excellence in information design.

Pre-industrial society: making artefacts

In small pre-industrial societies the maker of artefacts was probably also the user of those artefacts. There was no distinction between making and using. Moreover, the signs and symbols, or means of discourse—such as the markings on the bone fragment—were probably obvious in their meaning to their users, a mere reminder of knowledge already acquired.

As the skills of making artefacts developed and became more complex, the maker and the user of information may not necessarily have been the same person.

But societies were sufficiently small for mutual understanding and shared experience to guide those creating information which was usable by others within the same culture. The modes of discourse had commonly agreed upon meanings. Once again, there was no problem of accessibility or intelligibility.

Industrial society: designing artefacts

In industrial societies there has been an extraordinary differentiation in the skills needed to create information. To produce a book, for example, has required, in the past, the coordinated skills of an author, editor, illustrator, photographer, typesetter, platemaker, printer, binder, publisher and distributor. This differentiation of skills has also been attended by increasing complexity of the decision-making needed to undertake these tasks. So in the late 19th century, and more fully in the twentieth century, we begin to see the gradual emergence of the design profession as the coordinator, planner and synthesiser of these diverse skills.

Thus in industrial society, design became separated from making and using. But, drawing on the stock of signs and symbols commonly used within the culture's modes of discourse, the designer was still able to ensure that information was accessible and usable. Graphic design, as it is currently taught and practiced, still works within this industrial society's view of its activity.

Post-industrial society: managing process

In our own time many of the industrial technologies which led to the differentiation of skills are now converging around the one technology of digital processing. This has led to a corresponding convergence of some of the skills in the making of artefacts. For example, with the arrival of desktop publishing software, we can no longer easily distinguish between writer, editor, typographer, illustrator and printer. This is not to suggest that the levels of skill needed for each of these activities are not as great. As many of us have found, desktop publishing is often little more than amateur desktop typesetting. Nor is the trend uniformly towards convergence of skills: as new technologies are becoming more widely used new specialisations are emerging. But the convergence has given us a degree of personal technical control over the means of creating information which would have been impossible even ten years ago.

We can observe similar trends in areas such as film and television. With the arrival of post-industrial multimedia, we are seeing the convergence of film, television, sound and desktop publishing. If the creator of information using multimedia has the necessary skills, the new technology offers an unparalleled degree of technical control.

But as our control over technology has increased, our control over the means of discourse within our society has diminished. Our societies have become much more complex, socially diverse and specialised in functions. We can no longer be certain that the conventional signs and symbols and modes of discourse *we* understand are understandable to others; our way of reading the signs and symbols of our discourses will not necessarily be the same as other people's reading.

Unlike the intimate pre-industrial context in which the designer and user of information were both physically and socially close, in the post-industrial society we are physically remote and socially different from many of the users of information. Thus there may be a profound gap of understanding between us and information users. Conventional training in all the communicative arts in our society has failed to take account of this gap and still clings to a view that aesthetic judgment and a knowledge of the conventions of message-making are the means of determining how signs, symbols and discourse will be understood.

Information designers have been exploring and developing the skills needed to bridge the gap—skills that are not within the traditional repertoire of the maker or designer of artefacts. Good information design no longer means just creating an excellent object embodying the information. Additionally, it means ensuring that the process—the intangible trace of information use— is satisfactory. The primary focus is no longer exclusively on the making of artefacts. In our own society, the challenge is to satisfactorily manage the process, the relationship between information and user.

Managing an intangible process

The multiple skills of information designers

Managing this complex intangible process requires a range of techniques not usually found within the training of one individual. Good information design is most often the result of collaboration between a variety of individuals working in a team. The range of skills needed in such a team are interdisciplinary and come from five major areas: communicative arts, philosophy, systems analysis, ethnography, and negotiation.

In the communicative arts we would include such things as graphic design, writing, editing, film making and any other specialist media skills that form part of the potential solution.

Philosophers might seem at first strange members of the team until one realises that much twentieth century philosophy has focused on the philosophy of

language, perception and science, much of which is highly relevant to our contemporary understanding of information, its value and use. Philosophy, often incorrectly thought of as a purely abstract unworldly activity, is in fact our most advanced form of practical reasoning. Designing information successfully requires the best of practical reasoning.

Business systems analysis is also essential for good information design. So much contemporary information exchange takes place within complex organisations, and between these organisations and their publics, that an analysis of business procedures is vital.

Ethnography, part of anthropology, is concerned with studying people in different cultural settings. We need to study, at first hand, what people do with information in the different cultural settings in which they use it. Without this vital work, we have no way of knowing whether the information we design is usable or intelligible.

Skilled negotiation is vital to the success of information design projects. It is here that we see very clearly the differences between a craft practiced in the world and a science conducted in the laboratory. As Ben Shneiderman has astutely observed

> The social and political environment surrounding the implementation of a complex information system is not amenable to study by controlled experimentation… The experienced project leader knows that organisational politics and the preferences of individuals may be more important than the technical issues in governing the success of an interactive system. (Shneiderman, 1987 p 393)

Without skilled negotiation, the struggle over meaning which goes on throughout all aspects of an information design project, cannot be controlled and failure is highly probable.

Working together

Some information designers have made much of the collaborative work between writers, editors, and designers, suggesting that such collaborative work is the distinguishing feature of information design.

In the USA and the UK there are professional demarcations between these professions and the normal industrial process for generating a printed document follows a linear sequence, starting with the writer, moving on to the editor, followed by the designer. Breaking these linear tasks and responsibilities down so that all three professionals can work collaboratively, is a substantial achievement because it acknowledges the fundamental interdependence of text and graphics in design. But it falls short of an adequate basis

for solving information design problems. Firstly, the individuals need to learn a great deal about each others' crafts in order to understand how to work together. Secondly, many more skills than those of writing, editing, and designing need to be used to solve information design problems. And finally, we need to integrate the skills so that the end result is quite different from the mere sum of its parts.

There is an interesting debate currently within the information design community about the role of craft skills in solving information design problems. Patricia Wright, one of the most distinguished researchers in the field, has recently argued that a relatively crudely executed design can sometimes be extremely effective, so much so that the added cost of employing highly trained designers and achieving a high quality of finish cannot be justified in the improvement in performance it brings to the output (Stiff, 1990). Robin Kinross, in a recent review of Edward Tufte's book, *Envisioning Information*, argues that some of the model solutions proposed by Tufte are too elaborate technically and conceptually, and too fine aesthetically to be taken as exemplars to follow in everyday material (Kinross, 1991). But despite these debates there are good reasons for using the best craft skills to achieve excellence in information design.
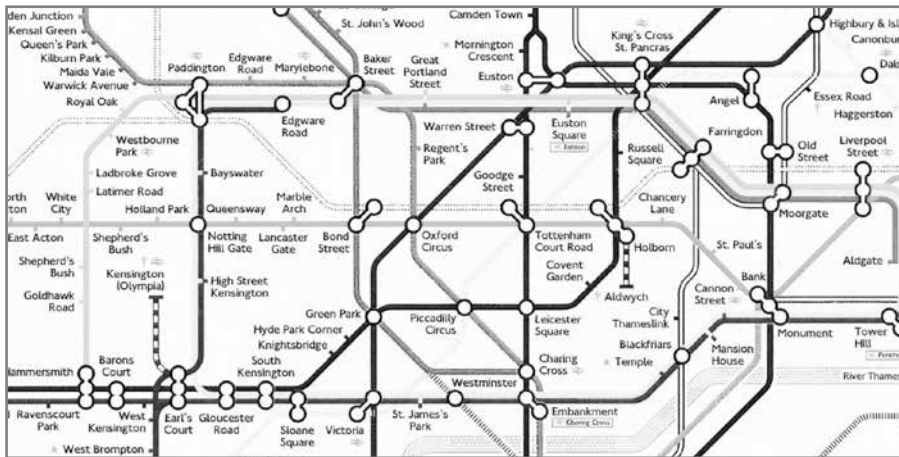
Highly skilled crafts people have a wide range of tools at their command and a substantial knowledge based on repeated experience which enables them to judge solutions that are most likely to work. For example, a competent wordsmith will have a broad vocabulary and a subtle understanding of text structures, connotation, styles, and ways of organising information. Much the same can be said of highly skilled designers. Neither writer nor designer may be able to predict, in any instance, which choice of words or graphic structures might work. But they would be able to eliminate unworkable solutions and experiment with a greater range of potentially workable solutions than unskilled persons. Moreover, if there is a need for fine distinctions and control of usage, only a consummate crafts person would have the necessary command of language or graphics to achieve such control.

With mastery of means also comes a capacity to create solutions that achieve an aesthetic value. If we can bring performance and aesthetics together—a unity of function and form—we can satisfy one of the deeper social objectives of good information design.

There is a tradition of thought going back to William Morris which permeates the modernist movement in design that began with the Bauhaus and finds some expression within contemporary cultural studies. It argues that the objects of everyday life deserve serious intellectual scrutiny and that, no less

than great works of art, the objects of daily life can appeal to our finer sensibilities. Information design, at its best, belongs in this tradition.

But solutions like the above do not arise perfectly formed in the studio. They are the result of many iterations and the help of many specialists which in the end achieve a masterful solution, these include philosophers, ethnographers, systems analysts and negotiators who can collect the evidence of success or failure and ensure control over the huge complexity of operational, social, and ethical factors that affect the outcome.

We have found that a proper mix of skills does not arise simply from putting people with the right skills together. We also need a unifying methodology and theoretical framework. Put simply, everyone needs to know when to do certain things and why.

When to do things: information design methodology

Information design methods follow a pattern common to other problem solving methods. In brief, the method consists of

- defining the problem
- involving all stakeholders
- observing and measuring the current state of things
- development and testing of prototype solutions
- iterative development and testing of prototypes until an optimum solution is found
- implementation and monitoring of the solution in use.

This is, of course, a highly simplified account of a complex process. But it contains the main signposts for the tasks. At the heart of the method is a process of continual measurement. Designs are judged on measured performance, not appearance.

There should always be some measurement of a design's performance. When improving an existing design, we measure the quality of information exchange before we start to improve it. Put simply, if we cannot measure current performance, we do not know whether or not we have improved it. You can best appreciate what we measure if you understand our theoretical basis for information design.

Theoretical bases of information design

Communication theory provides the conceptual framework for information design at the Communication Research Institute of Australia (Sless, 1981 and 1986, Penman, 1992). But ours is not the communication theory of Shannon and Weaver, or its later sociological, semiological or cultural studies elaborations (Fiske, 1982). Rather it is a theory which has its intellectual roots in post modernist thinking, and its empirical grounding in the constant testing and development of information design solutions. The world has been our laboratory and our theory emerges out of and informs our practice. We do not suffer the usual sad separation of theory and practice which is to be found in so much of the humanities, social sciences, and design professions. While this is not the place to explain the theory in detail some important points are in order.

We have not sought to construct an elaborate theoretical edifice, rather we have sought the minimum number of propositions that can sustain our work. Thus there is no elaborate conceptual system, only a few guiding ideas.

One of the most important and useful of these has proved to be the idea of communication as an irreducible action in one of two domains: the reader/text domain, and the author/text domain (Sless, 1986). These constitute the basic units of analysis and measurement that have guided our work. The primary focus of our theoretical discourse is communicative action. The empirical product of such action is meaning.

Another important idea in our thinking is that of position. Put simply, the communicative world is like a landscape. What we see depends on where we are standing. Therefore our observation and measurement is always relative to particular positions and must take that into account. There is no god-like vantage point from which we can observe the world as a neutral detached observer. We are always participants. But not in the simple sense such as that found in quantum mechanics. Participation in the communicative world always involves us as researchers actively reading the actions of others, ascribing meaning to our own readings. Ours is not a world of fixed and immutable physical laws but of changeable and contestable humanly-created rules.

Our conceptual machinery may be simple but it confronts a complex set of phenomena which we, in part, help to create. Thus our landscape is like the surface of a giant trampoline; as we move across it we deform the landscape by our own actions.

Notice the absence in this scheme of cognitive or psychological factors. We have not found it useful to reduce human action to information processing or mental states. Such things as cognitive maps, mental models, attitudes and beliefs do not feature in our work. We have found there is a severe penalty to pay for such reductions: one needs to acquire an elaborate and highly abstract set of concepts, all of which are surrounded by academic controversy and none of which lead to predictable outcomes. The conceptual investment is simply not worth the return, and we have found that we can achieve predictable outcomes without them.

What information design is not

Often people commissioning information design work make the fundamental mistake of asking the wrong professionals to undertake the work. It may seem at first sight that designers, particularly graphic designers, and scientists, particularly in fields such as social science, psychology, or human factors (sometimes called cognitive science) are the most appropriate professionals to undertake information design work. Our experience suggests otherwise. While these professionals can contribute to information design work, as part of a team of specialists with a broader set of skills, their training and knowledge often limits the value of the contribution they can make. In isolation from other skills, their contribution can even be negative.

Information not graphic design

The reason for this is that there is a subtle but important difference between our development of information design, and the conventional teaching and practice of graphic design.

Many graphic designers would claim that information design is subsumed within their profession. But there is a wide gap between the typical criteria of judgment applied by graphic design professionals and teachers, and those we have developed in information design.

The basis for assessing quality in graphic design is the appearance of the work, as judged by technical, formal, and aesthetic criteria. Graphic design journals, awards, and student assessments all reinforce the central importance of these aesthetic, formal and technical criteria.

The contrast between graphics and information design is stark. A necessary condition for good graphics is its appearance; a necessary condition of good information design is its *performance*. A design can win a graphic award purely because of its appearance, with no evidence offered or asked for regarding its performance. There is frequently a token acknowledgement of information quality, with many graphic designers and educators assuming that if the aesthetic, formal and technical criteria are met then the quality of information is assured. This is not necessarily so.

Graphic designers trained in Australia receive little or no training in the full range of techniques that would enable them to undertake information design work, particularly the skills in research and negotiation that they would need to judge the quality of information design, and successfully manage outcomes.

Most courses prepare students for careers in advertising and studio-based graphics. Regrettably, the heavy emphasis on formal and aesthetic judgment often makes it difficult for designers to approach information design problems with the necessary humility, believing, as they do, that their own judgment is a sufficient basis for deciding whether a design is successful or not.

This is a sad reflection on our current educational system. Overseas there are a number of institutions offering information design training, but there are none in Australia.

Craft not a science

Information design is a craft more than it is a science. This is not to suggest that there are no scientific questions or findings relevant and helpful to information designers: scientific research has contributed to better information design. Nor does it mean that we cannot study the process of information design scientifically. Much of this paper is based on research into design processes conducted by the author and others (Sless, 1975). Further, this does not mean that information designers cannot develop designs with predictable performance characteristics. One of the important characteristics of the best practices in information design is that it can lead to predictable outcomes. Finally, it does not mean that information design does not use methods that derive from science. Many of the design testing methods used by us derive from social science research methods.

The critical differences between a craft and a science is one of purpose and tradition. Information design is first and foremost concerned with solving practical problems within and through a specific cultural and historical context. To that end, information designers draw on the full range of skills, knowledge, and processes available to them, some of which pre-date scientific knowledge

by many thousands of years. Scientists can only draw on the stock of replicable research findings and generalisations in their field.

Naturally, while solving particular information design problems, one develops insights and collects data that can become generalised, scientifically valid theory and knowledge, but this is a happy by-product of information design, not its central purpose.

For an activity to be scientific it must be first and foremost concerned with adding to or contesting the cumulative knowledge and understanding of the world. Information design is only incidentally concerned with these issues. Science aims at generalised and durable solutions to problems. Information design creates highly contextualised solutions. Science also aims at producing replicable results. It is highly likely that any two information designers, working on the same problem, would create different but nonetheless equally valid solutions.

There is often a mistaken but popular belief that if scientists are investigating something they necessarily understand it. This may not be so. In fact one of the main reasons why scientists investigate things is because they don't understand them. So if someone is conducting research into human computer interfaces, it does not automatically follow that they know how to design such interfaces.

Many of us working as information designers have come to regard the findings from such research as of limited practical value in developing designs that work. In fact, some of the leaders in human computer interaction research have themselves commented on the disappointing contribution that cognitive science has made to interface design (Mantei, 1991).

Many of the 'discoveries' made with this type of research simply confirm already-known standards of good design practice, or provide laboratory data that cannot be applied to practical, highly-contextualised information design problems. For example, taking typography as a basic aspect of much information, Hartley, a psychologist with long familiarity with typography, says after reviewing the research literature:

> The research literature does offer some generalisations but such advice to printers hardly seems world-shattering (Hartley, 1978 p 109).

He comments also about the usefulness of the research to designers:

> [R]esearch in these areas is not very helpful to designers… principally because such variables as typesize, line length and interline space have been studied independently of the typographic design of highly structured information (ibid. p 109).

The question is not whether research has contributed to knowledge but whether that knowledge is new or useful in practice.

In moments of candour, psychologists have admitted that their understanding of the very basic skills of reading text and understanding pictures, on which so much information design relies, is very meagre. Ulrich Neisser, one of the founders of cognitive science, has said that our ordinary capacity for reading text represents an achievement as impossible in theory as it is commonplace in practice (Neisser, 1967). Something we do every day in our interactions with information remains elusively out of the reach of our conventional scientific ways of understanding. Similarly, according to the late J.J. Gibson, studying perception,

> The perplexities involved in making and looking at pictures are wide
> ranging. They point to unanswered questions in psychology.
> (Hagen, 1980 p xvii)

The fact that psychologists do not understand how these processes work has never inhibited the development of pictures and illustrations in the past and is unlikely to do so in the future. But even if scientists did understand how our reading of text or pictures work, there is a considerable difference between the intellectual knowledge derived from research and the practical knowledge derived from making text and pictures. Indeed, asking a scientist with no experience of the craft of typography or illustration, no matter how well qualified, to design the text for a book, the label for a bottle, or the screen for a computer may be like asking a successful gambler to ride a horse to victory in a race. Knowing *about* something is not the same as knowing how to do it.

There is, of course, no hard and fast difference between science and craft. I am speaking of tendencies rather than absolute distinctions. As will be clear with the historical example given above, the distinction between craft and science is blurred.

But there are good practical reasons for suggesting that craft rather than science is the parent of contemporary information design. When information designers look to the communicative crafts of the past centuries for examples and wisdom, they draw on a rich and ancient tradition. Scientific research in information design is largely a twentieth century phenomenon which has yet to prove its value in solving design problems.

Those information designers who have based their contemporary craft exclusively on a knowledge of this research literature have ignored a vast storehouse of possibilities, and inevitably this has led to impoverished or weak solutions.

The important lesson in this is to be wary of asking scientists to solve information design problems, and to be sceptical of scientists who claim to understand information design problems without a practical training and knowledge of the relevant crafts and their traditions of practice.

Information design and people

It has become a cliché to say that we live in an information society. But to understand the relevance of information design to our information society it is important to ask what information means to people as workers, citizens and consumers.

Much of the work in our society is information intensive. This means that workers have to read, write, and fill in forms, use computers, telephones, fax machines, and copiers, and take action using the information coming from these sources as part of their normal daily activity. Their productivity and hence the efficiency and profitability of the organisations they work for depend on their effective use of information.

Information is at the heart of the relation between citizens and the state. Citizens know about their obligations, rights, and entitlements through legislation, pamphlets, explanatory booklets, letters, telephone enquiry systems and the like. The state informs the public about the economic and social conditions of the nation through publications, information campaigns, press releases and many other means; and the state finds out about the public through data collected on forms, the information from these is stored in data bases. State planning and policy depend on information. Ultimately, the quality of the relationship between citizen and state is dependent on the quality of information that passes between them and how that information is used. The fragile consensus politics of democratic societies depend on the belief that the information transactions between state and citizen have a basic integrity and value.

Consumers make purchasing choices based in part on information. Once purchased, many products can only be consumed appropriately if the information that comes with them is accessible and usable.

Many competing brands have similar performance. One widget can be very like the next, one service can be like all the others. But the product that is easier to use because the instructions are clearer is potentially more marketable; the service that is more understandable—whether it's in finance, travel, insurance, telecommunications—has the edge over its competitors.

Further, the product explained in this way—so consumers can assess both the benefits and risks with its use—is less liable to be misused. Consumers are at less risk and manufacturers are less liable to litigation or prosecution.

Information quality not technology

There are of course many ways in which we could characterise our information society, particularly if we focused on the technology. But this would be very

short-sighted. It will not be long before the ubiquity of information technology is taken for granted, like plumbing is today. We will however, still be faced with the problem of information quality at work, in our relations with citizens and government, and as consumers, manufacturers and providers of services. Whether the information is to be created on a multimedia system, a piece of paper, a VDU, or a product label, it has to be designed so that it can be understood and used.

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