Customers' Use of Products as Design Tools

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Abstract: Understanding the needs of those who use products is a core part of design research. This paper describes research suggesting the usual concept of 'user need' is overly restrictive. The research points to the widespread practices in which people use designed artefacts as 'tools' to design their own lives. This use of designed products as design tools can be more central to users perception of value than the more explicitly expressed 'needs' that are the main basis for a design brief. Extending the concept of user needs in this manner has significant implications for: the development of improved forms of design brief; understanding of user interaction with designed artefacts; designers education; data gathering processes; and the development of design methods and design theory. The research builds on a secondary analysis of the literature on design failure originally initiated in the field of Management Information Systems (MIS) at Edith Cowan University. The paper proposes a typology of 14 different classes of design tools used by both professional and non professionals in designing. The paper describes a variety of ways in which products are repurposed by people to act as design tools in everyday designing of their lives. The paper concludes with a brief overview of the implications for design theory, the modeling of design processes, design management and design practice.

Key words: *design tools, user needs, design process, participative design*

1 Introduction

Many management information systems (MIS) have suffered high levels of economically and socially costly failures see, for example, [1-4]. During the 1990s, Petroski [5-7] concluded the main reasons for design failures lay in design processes, especially where knowledge was not made explicit to enable learning and improvement [8]. A weakness in MIS design has been a neglect of human issues and an over emphasis on technical aspects of design problem and solution [2, 4, 9]. In many cases there has been a lack of attention to human aspects of designing and personal issues relating to stakeholders and users [3, 9, 10].

Research by the author into MIS design failures, reported in [11], led to the observation that in everyday life, many individuals use web-based products in a variety of ways to help them design their lives. This observation is significant because it points to:

1. Individuals repurposing web-based products

2. Web-based products intended to fulfil other user needs being used as design tools
3. An understanding that the designing of everyday life done by individuals provides a contextual frame for understanding user needs
4. The full scope of design process associated with a product extending beyond its production and distribution
5. Individuals use a variety of forms of products as design tools in the everyday designing of their lives

This paper expands on this observation. The main contributions that have emerged as a result are:

- A preliminary typology of design tools
- Increased detail in understanding the ways individuals use products as design tools in their everyday lives
- An understanding of some of the implications for design theory, modelling design process, design management and design practice.

This research draws on a tradition that regards designing as an activity undertaken by all humans and not just professional designers (see, for example, [12-17]). Simon [17] defined design broadly: "To design is to devise courses of action to change existing situations into preferred ones". His definition applies to anyone involved in making plans to change the future and is especially appropriate to building coherent theory across design domains [18]. Key aspects of Simon's definition are: that designing is an intrinsically human internal non-routine activity whose outcome is a *plan*; that designing may be a part of any activities aimed at creating a change; that designing is not solely an activity of professional designers; and that designing can occur at micro and macro levels in many different types of human activity across individuals' work, private and public lives.

2 Design Tools

Professional designers utilise a wide variety of design tools to facilitate their designing. These range from expensive and sophisticated computerised information support systems to inexpensive memory aids such as pencil and paper. The research found that individuals, in the day-to-day designing of their lives, also used design tools, and these were used for similar functions as the design tools of professional designers.

2.1 A typology of design tools

One of the early contributions from the research was a preliminary design tool typology. This typology has 14 classes, each of which characterises a different role for design tools:

- As memory aids
- As symbolic functional representations (e.g. formulae, systems diagrams and case studies)
- As means of *making* symbolic representations (e.g. languages such as UML, software such as Vensim)
- As representations of partial solutions (e.g. morphological sketches)
- As means of making representations of partial solutions (e.g. techniques of paper prototyping of websites)
- As prototypes
- As means of making prototypes
- As information sources
- As information searching tools
- As data gathering tools
- As process guides

- As surrogates and conceptual substitutes
- As means of affective sensitisation
- As means of cuing, prompting or modifying an individuals internal thought processes
- As exemplars.

Typical design tools used by engineering designers include CAD systems, equation books, material specification data books and rapid prototyping systems. Each of these might be regarded as belonging to one or more of the above classes. Similarly, typical design tools used by graphic designers such as colour charts, RGB to Pantone conversions, page layout software, computer screens, font catalogues, and proof printing equipment can also be classified in terms of their role using the above classes.

Observation of everyday planning events indicates that individuals repurpose products to use them as design tools to assist with designing their lives. These repurposed everyday products can also be classified using the above typology indicating they are used in the same roles as design tools for professional designers.

2.2 Example: design tools used in buying a car

A simple example of using a product as part of a design process is when people are looking for or buying a car. Where buying a car is for an individual part of a larger process of planning and shaping their life, the role of the vehicle as a design tool may occur in several ways. The most obvious involves the style and cultural characteristics of the vehicle as they relate to the individual's potentially redesigned life. Pictures and instances of the vehicle itself together with its promotional material are used as information sources and contextual backdrops for images relating to and, later, signalling a designed change of future. In the case of style issues, the product itself and the advertising about it that emphasises its style cues are perhaps the most important information resources providing functional information. Part of the value of advertising of cars is it shows the use of a vehicle in a variety of contexts. The car, its advertising, and other related information sources may also be acting as a design tool in the class of partially completed prototypes (not that the car is a partial prototype but that the individuals design of their future is), and also in the class of exemplar.

For some people, functionality rather than style and culture is more important to designing their future. In these cases, data about vehicles, via e.g. technical data sheets provided by the manufacturer, become more relevant than style issues and style data. These technical sources act as design tools similar to technical information resources used by professional designers.

2.3 Products as design tools: decision making processes

Decision making processes have similar roles in individuals' everyday design processes as they do for professional designers in their work. For example, a decision to be made by an individual about whether (say) to buy this or that sofa is framed by similar considerations to those used by an interior designer in planning the future feel and style of an interior space. Naturally, there would be expected to be differences in levels of skill, experience and expertise, and differences in the workplace contexts within which design processes are undertaken. The interior designer is likely to be surrounded by professionally produced design tools, e.g. Laminex samples, fabric swatches, colour charts, books of style exemplars, specialist manufacturers catalogues, examples, information about relationships between spaces and peoples use of it (e.g. pattern languages [19], automated means (CAD software) of viewing circulation, heat flow light dispersion etc. For the consumer and user acting as designer, design tools are more likely to consist of the products around them pressed into service and repurposed,

as design tools: plus whatever other semi-professional design tools can be obtained from, for example, DIY stores, retail shops and bookshops.

2.4 Products as Design Tools: Promotional Environments

In the case of many products, the main attributes that make them useful as design tools for individuals' everyday designing result from the ways they are promoted, e.g. in retail stores. One of the most important roles of design tools is to help designers visualise a 'rich picture' of a range of futures. An important issue for those involved in promoting, marketing and advertising products is to use promotional materials and product sales environments to assist individuals in envisioning possible futures. Many advertising and promotional arrangements show pictures of possible futures containing products. Much of the practically of products' roles as design tools come from this. In many cases, the intention of advertisers is to also stimulate affective sensitisation to the designed object and possible futures containing it. This 'means of affective sensitisation' is another class of design tool.

2.5 Products as Design Tools: Technical Materials

The role of technical information provided with or embodied in products can act in several classes of design tool in functional aspects of everyday human design processes. For example, understanding a product is not 'dishwasher safe' helps raise in an individual's mind, thoughts such as whether or not the person involved is likely to own or not own a dishwasher. This functionality lies in a class of design tools that relate to cuing, prompting or modifying an individual's internal thought processes. In many cases, attributes of a product are described via its packaging - broadly, all the accessible information provided through advertising whether at the point of sale or remotely, e.g. on the manufacturer's website. Product associated information can act as design tool in the classes of memory aids (checklists and memory joggers) for aspects of design problems an individual might find useful in everyday design deliberations.

2.6 Products as Design Tools: Informal discourse

Everyday conversation offers other insights into how individuals use products as design tools. Examples can include informal speculations about possible futures seen in comments such as, 'When I win Lotto (a national gambling program), I'm going to buy a new XYZ so that I can . . .' Informal discourse such as this illustrates how individuals use 'memories of artefacts' and 'information about artefacts' as design tools of different classes to contribute to their everyday envisioning of possible futures.

2.7 Products as Design Tools: Electronic Media

Electronic channels such as the TV, radio and the Internet form the basis of another means by which products and their associated paraphernalia are used as everyday design tools. All these modalities of channel and product can be pressed into use as design tools, mainly in the classes of information sources and information searching. In the case of the worldwide web, keyword searching, e.g. through Google, clearly falls into the information gathering modes of design tool. In the case conventional television and radio, information useful to designing an individual's life can be gathered though channel surfing done in real time, or through asynchronous data gathering by choosing which programs to listen to or to watch. The duality of asynchronous and real time data gathering also applies to books. The role of books as design tools is well accepted. Many coffee table books are created to fulfil a similar role to professional designers' texts. For example, books about beautiful beach houses act as design

tools in much the same manner that tables and product exemplars and style guides act for professional designers, or furniture exemplars act as design tools for furniture makers and interior designers.

2.8 Products as Design Tools: Physical Surrogates

Finally, designed artefacts can have a role as design tools by being simply physical surrogates. This can be seen, when individuals, or professional designers, say something like 'Let these two plastic cups represent two buildings, and this spoon a walkway between them…' The two cups may be nothing like what they represent. There role is to act as conceptual or 'space' place holders.

3 Implications of findings

There are implications of the above findings for design theory, modelling design process, and managing professional design activity and design practice.

3.1 Implications for design theories

The central implication for design theories is in terms of a broader understanding of the role of designing in people's lives. In theory terms, the above approach adds support for research positions that view designing as a generic human activity at the level of thinking and feeling. It suggests that defining designing only as a skill of a credentialed professional designer class is less than adequate in representing the extent of design activity. The fact that individuals use products as design tools in the everyday planning of their lives means the ***actual*** identity, purpose and use of products are designed by users in ways that are different from the conceptualisations of the professional designers who undertook the original designing of the products. More seriously, this also implies the actual roles of products may invalidate the analyses on which health and safety issues are professionally managed by product-sponsoring and design organisations.

3.2 Implications for modelling design processes

There are also implications for modelling design processes. The paper has demonstrated ways that people who are not acting as professional designers repurpose products as design tools and hence undertake part of the design process for the actual uses of these products. This implies this 'repurposing as design tools' combines with earlier professional design activity as part of a larger design process for these products. In theoretical terms, comprehensive models of design process would be expected to include these additional stages undertaken by individuals who are not acting as design professionals. This presents several theoretical problems to design process modellers. Perhaps the most conceptually challenging of these problems is that some of the designing occurs *after* the manufacture and sale of the product.

In design process terms, the idea of individuals using products for other than their original reasons is not entirely unprecedented in the design literature. Similar considerations are discussed in the literatures of alternative technology and technology transfer see, for example [20-22]. Other precedents are found in the early history of design research when it became evident that it was not helpful to view designing as something that happened prior to, and entirely separate from, manufacturing and marketing, e.g. [23-28]. These early models of design process had weaknesses of a similar type to those raised in this paper. As design process modelling developed, it became essential to include manufacturing and marketing participation in models of design process. The ways individuals

use products as design tools in their everyday designing might be included in models of design process in a similar manner.

3.3 Implications for design management

The above implications for design theory and modelling design process suggest that there are benefits to design managers and design sponsors from the above analyses to improve design outcomes.

The findings of such extended user research not only offer a means for improved designing of products, but also offer means of gaining marketing benefits from competitive advantage through product differentiation. In turn, this suggests a need for the organisational structures around design managers to have 'feed forward', as well as 'feedback', loops between them and areas such as Marketing and Manufacturing to help improve the outcomes from these functions.

3.4 Practical Implications for Design Practice relating to Products, Systems, Services and Organisations

The implications of the above analyses for design practice are extensive because they point to the need to re-envision the idea of user-need, one of the central tenets of design practice. By implication, the analyses also imply significant changes to the practical techniques associated with gathering information about the needs of users, and the ways they use products. More challenging still is the idea that designers should focus some of their design efforts on what users might do with the designed objects in ways wildly different from the primary design intent.

This latter presents a complex and unusually open-ended challenge to practicing designers. It requires designers to think how their products systems and services might be used in completely different manner, and for different purposes, from the intention for which they are designing. Essentially this is going in the opposite direction of the majority of design practices and design methods whose role is in identifying best solutions. Exploring the types of design methods and design practices appropriate to identifying *all* possible uses of products is a significant consideration and left to another time. The problem is, however, bounded in terms of the analyses of this paper because of its focus on how people use designed products, systems, services etc as 'design tools for designing their lives'. The preliminary taxonomy presented in the second section of the paper offers the basis for product and other designers to ask how their design, or parts of their design, might be used as the different categories of design tools in the taxonomy. For example, it is possible to ask whether people might use a design as a 'memory aid' or as help for then to envision what they might feel like in particular future situations (a design tool for affective sensitisation).

4 Conclusions

Summarising, the paper draws attention to the ways customers use products as design tools in everyday design processes for designing their lives. The paper suggests this gives significant additional understanding of 'customer needs' and 'factors affecting customer choice' because it provides increased understanding of processes that underpin needs and choices. The proposed approach draws attention to implications of this perspective for design theory, design process, design management and design practice. The paper points to potential for additional commercial benefits in taking individuals' personal design activities into account, especially the ways individuals use products as design tools in their everyday designing.

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