INTERNATIONAL CONFERENCE ON ENGINEERING DESIGN
ICED 05 MELBOURNE, AUGUST 15 – 18, 2005

Value Centred Design:
Understanding the nature of value

MICHAEL REBER and ALEX DUFFY

Abstract

Current design approaches do not focus on *value* in an explicit manner. Rather they tend to focus upon product features such as functionality, aesthetics, behaviour and costs. The goal of this paper is to add to the design domain an understanding of *value in design* and to introduce *Value Centred Design* (VCD) as a philosophy aiming to deliver *value* to the enterprise, customer and society. *Value* related design issues and requirements for VCD have been identified on the basis of generic *value characteristics*. These characteristics were determined through a literature review and interviews of people across different departments within eight companies.

Keywords: design philosophy, need, personal value system, value, Value Centred Design, value characteristics, value in design;

1. Introduction

Creation and management of *value* has become a major issue in economy. Chief executive officers confirm *value* as an important parameter for business navigation. Authors claim that "management should focus on *value* creation"[17] and "companies *need* to shift from a traditional view of seeing their business as a set of functional activities to an externally-oriented view, concerned with seeing the business as a form of *value* delivery"[8]. Consequently, *value* often dominates the agenda of top management. However, investigations in literature and industry highlight that there is neither a common understanding of *value* across disciplines nor a common understanding of *value in design*.

What is suggested in this paper is that more attention is given to *value* coming from product design. Design artefact and process might be understood as resources to deliver *value*. Current design approaches do not focus on *value*. Instead, "we cope with *value* complexity via a common *value* basis usually represented in product specifications"[5].

Value Centred Design (VCD) is introduced as a *design philosopy* with the overall aim to deliver *value* to the enterprise, customer and society. The research work is based on

insights gained from a literature review and an industrial investigation on the current understanding of *value*.

It is suggested that *value* does not reside in design artefacts per se, but rather in their interpretation in a given situation with respect to a particular criteria. Design goals are not generally specified in terms of their *value*. Consequently, there is a risk that design activities do not generate *value* for the enterprise, customer and society.

2. Value Centred Design

VCD is a *design philosophy* with the overall aim to deliver *value* to the enterprise, customer and society[1]. To deliver *value* might be considered to be the purpose of product design in our current economy. Behind VCD is an assumption similar to what has been said by Andriessen [3]:

> We are not in business to design products – we are in business to make use of product design to generate *value*.

The determination of *value* within a specific situation is personal. As such, *value* does not reside in artefacts per se. If people assess a design artefact to determine *value*, they use different criteria derived from personal value systems (PVSs), thus from personal *need*. Every design artefact can have more than one *value* related to it. Because of different criteria derived from PVSs, *value* of the same design artefact might be different to different people. PVSs and criteria used for assessing *value*, change dependent on situation. Thus, *value* of an artefact changes even if the artefact per se has not been changed. Consequently, VCD has to accommodate more than the function, behaviour and structure to deliver *value* to the enterprise, customer and society.

Due to the significant dependency of *value* on a person, the discussion of *value* in product design requires a definition of what enterprise, customer and society *need* is and consequently, what the criteria are to investigate *value*. Although design goals specified in current design approaches might deliver *value*, by no means is there explicit consideration and management of *value*. VCD requires an analysis of design goals against their *value*. It is significant that the definition of design goals should be based on the contribution to enterprise, customer and society *need*.

Humans have a *personal value system*, understood as a hierarchy of *needs* [16]. From a design process point of view, personal *value* is relevant at each stage of the design process where something might be judged or decided. As such, personal value has a relevant impact on the design process. Thus, in early stage design, PVSs might lead to different problem settings; during the design process, different functions, structures and product behaviour might be considered; for design evaluation, different evaluation criteria might be used. Overall, judgement and decision-making processes in design rely on PVSs. Consequently, what is required for VCD is an alignment of PVSs to enterprise, customer and society *need*. Another point in the context of decision-making is that current decision-making in product design focuses on technological alternatives rather

[1] For this paper, issues on value to society are not considered.

than on *value*. In this sense, VCD requires decision-making support to be based on *value* of alternative solutions.

In product design, a balance is required between enterprise, customer and society *value*. A product developed with a focus on enterprise *value* only, might not be of interest to a customer. On the other hand, products designed with a focus on customer *value* only, might generate little if any *value* to the enterprise. Current design approaches do not balance enterprise, customer and society *value* in an explicit manner. VCD requires the ability to balance different *value* types. Thus, "good design" may be thought of as being the pivotal point between *value* types related to a design artefact.

VCD might expand the design space. In VCD attention is given to an analysis of enterprise, customer and society *need*. From this, design goals might be derived and *value* might be determined. Take a design process of a "pen" as an example. In current design approaches, a goal might be to "design a pen". From this requirements might be derived like ergonomic aspects, colour etc. VCD would not take the design goal as given. Instead, *need* would be analysed and in our case, we might come up with the result that "people *need* to write". However, "to write" is possible with a "pen", "pencil", typewriter, etc. Thus, the design space determined via VCD approaches might be broader than in current design approaches.

3. The nature of value

To step towards a more VCD approach, we *need* to understand the nature of value itself. This chapter presents insights on value gained from a literature review and an industrial investigation. Generic *value characteristics* have been identified.

3.1. Literature review

Value has been considered in single disciplines from many different perspectives. Economy, Engineering, Marketing, Philosophy, Strategic Management and Social Science are disciplines that have made significant contributions to the *value* discussion. Accounting, Advertising, Aesthetics, Brand, Ethics, Motivation, Religion, Situatedness are examples of *value* related domains. Within these studies, there are many differentiations of *value*. Allingham [1] for example defines *value* of an asset "as a function of usefulness and availability". Ashworth [5] states "*value* is regarded as an entity made of scarcity, utility, const of production, worth of use, *value* in exchange and marginal utility". Bailey [6] concludes that "*value* in its ultimate sense, appears to mean the esteem in which any object is held. It denotes, strictly speaking, an effect produced on the mind". Burns [9] defines *value* as a "functional outcome, a goal, purpose or objective that is served directly through product consumption". Lapierre [15] understands *value* "as a result of new marketing approaches like new ways to offer products, distinctive product service and innovative product/service delivery", and Rokeach [18] in the context of human *value* concludes that "*value* is an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence".

There is no common understanding of *value* across disciplines. Current *value* definitions are specific to particular disciplines and complexity is seen as one of the main reasons for difficulties in using *value* based business approaches. An investigation was carried out to determine the current understanding of *value* in industry.

3.2 Industrial investigation

An industrial investigation on the current understanding of *value* was carried out in Germany (2002), involving market leaders in mechanical engineering. A total of eight companies were involved, and thirty-two open interviews were performed across different departments. Six chief executive officers, seven heads of engineering departments, twelve product designers, three product managers and four sales people were *interviewed* to express their current understanding of *value*. Although the interviews were limited to mechanical engineering, there were never less interesting results.

For instance, chief executive officers confirmed *value* as an important parameter of business navigation, but there was no common understanding of *value* either among chief executive officers or between departments and individuals. On the one hand, *value* is seen as being somehow related to economic and financial issues. On the other hand, *value* is seen as being associated with ethics and moral principles, an emotional issue, and dependent on the experience of people. Overall 50% of the industrialists considered that there was a relation between *value* and profit. Some of them expressed their understanding of *value* as a kind of measure, which can be positive or negative. 87% believed that an alignment of personal and company *values* could be important for company success, would result in satisfaction and stimulate one's own initiative and motivation. A surprising result was that none of the product designers was able to express their understanding of *value* in the context of design artefact and process.

From the industrialists' point of view, to generate *value* is related to activities. All participants agreed that activities of the production process generate *value*, but only 25% believed that *value* might also be generated in other business processes. All participants agreed that goals could not be achieved without generating *value*. The all focused on business goals rather mentioning personal goals.

3.3 Value characteristics

To investigate *value in design*, a possible approach would have been to look at the specific characteristics of *value in design* and add a further value definition to the domain. However, the approach taken in this research work to date is to look for generic *value characteristics* to develop a generic value definition and new insights into the nature of value before considering the design context. Insights on *value characteristics* have been gained from the results of a literature review and an industrial investigation.

A common factor across disciplines is that people determine *value*. This is true for authors defining *value* specific to certain disciplines (e.g. [1], [3], [5], [6], [9], [15]), economists analysing the *value* of an enterprise (e.g. [4], [17]), engineers focusing on the creation of *value* (e.g. [5], [12], [14]) as well as for industrialists trying to express their understanding of *value*. Thus, *value* is fundamentally **personal** in a sense that it cannot be determined without people.

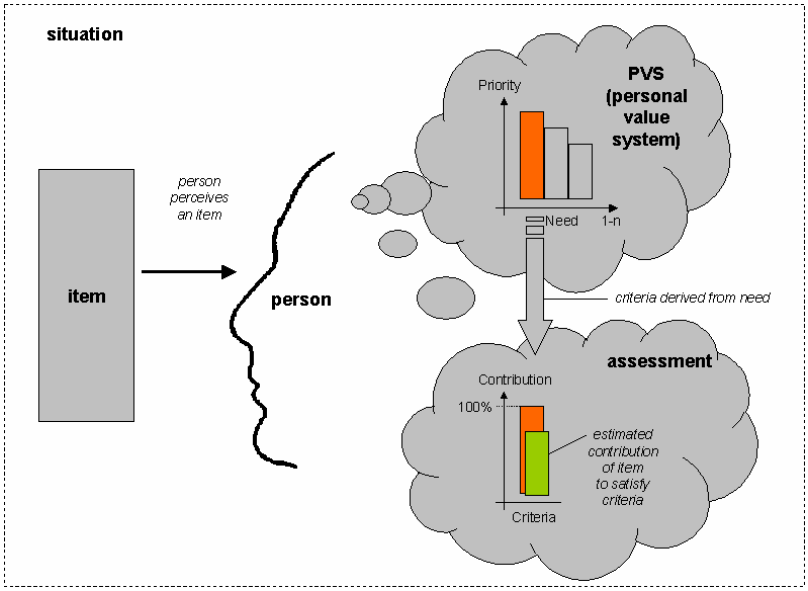
If a person determines *value*, the person is involved in a situation. Clancy [10] states in the context of situated cognition: "Every human thought and action is adapted to the environment, that is, situated". If *value* is dependent on people, it is dependent on human thought – thus, it is situated and subject to situatedness [7]. *Value* is determined in a certain **situation**.

In literature, *value* is determined via "asset" [3], "entity" [5], "object" [1], "marketing approaches" [9], etc. In the industrial investigation, all participants determined *value*, consciously or unconsciously, in terms of "image of product", "quality of product", and "spirit of the house". Thus, *value* is determined in relation to an **item**. A result that is confirmed by Feather [11] who argues: "*Values* do not exist independently of person and objects".

Different criteria such as "health", "revenue", and "turnover" are used in literature to determine value; in the industrial investigation, the participants used "image", "quality", and "spirit" to determine value. We might conclude that the determination of *value* requires certain **criteria**. The criteria might be derived from *need*[2].

Finally, the determination of *value* involves an activity in the sense of an assessment estimating the contribution of an item to satisfy a certain criteria. In other words, if people determine *value*, they valuate and/or evaluate. As an example we might consider *value* of a car, which might be valuated against the criteria "to get from A to B", or "to drive 100 miles per hour". People via an **assessment** determine value of an item.

Figure 1: Value determination process



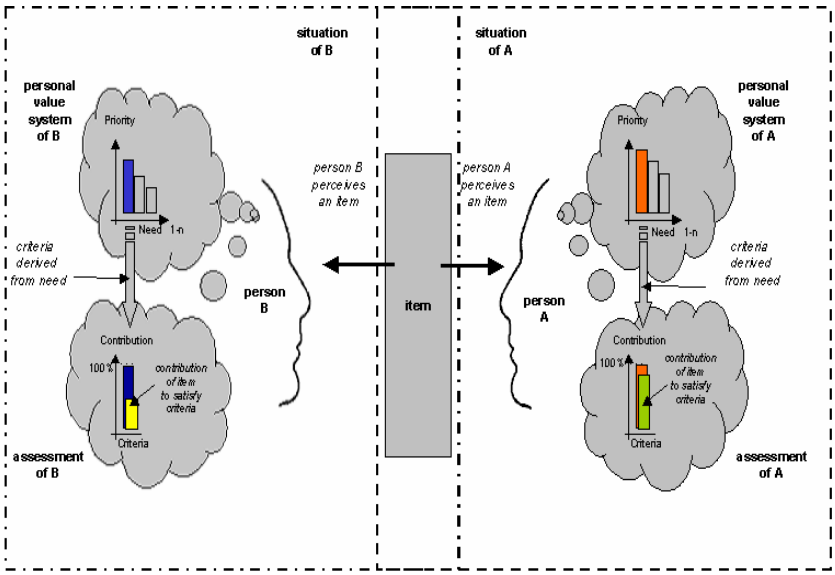
Based on the generic characteristics of *value*, a model has been derived to outline our current understanding of the *value* determination process (Figure 1). The determination

[2]Investigation on *need* is ongoing.

accommodates a person, situation, item, PVS and an assessment. The model is based on the assumption that each person determining *value* is involved in a certain situation and has a PVS understood as a hierarchy of *needs*. In the context of a situation, a **person** does assess an **item** against its contribution to satisfy certain **criteria**. **Criteria** are derived from a PVS. In the assessment, the contribution of the item to satisfy certain criteria is valued and/or evaluated. *Value* is determined if the assessment indicates a certain degree of need satisfaction from the item under investigation. The person who determines *value* has not to be the person who perceives *value*. An item can be of *value* to a person although the person who perceives *value* is not aware of item, need, criteria and assessment.

Investigation on *value* determination of different people, shared value systems, and shared criteria is ongoing. People determine *value* based on different situations and different personal value systems (Figure 2). They derive from personal value systems different criteria to assess *value*. Consequently, the same item might have different *value* to different people. However, it might be suggested that shared value systems and shared criteria exist.

Figure 2: Value determination of different people



4. Conclusions

Current design approaches do not focus on *value* in an explicit manner. Although design goals in current approaches might deliver *value*, by no means is there explicit consideration and management of *value*.

Value Centred Design (VCD) is a *design philosophy* with the overall aim to deliver *value* to the enterprise, customer, and society. To deliver *value* might be considered to be the purpose of product design in our current economy. Behind VCD there is the assumption

that we are not in business to design products – we are in business to make use of product design to generate *value*. To deliver *value* to the enterprise, customer and society, *VCD* requires an analysis of *need* to define design goals based on *value*, decision-making support based on *value* of alternative solutions and the ability to balance enterprise, customer and society *value* related to a design artefact. Design goals have to be adjusted to changing *need* throughout the design process. An alignment of PVSs to enterprise, customer and society *need* is required, because of the relevant impact of PVSs on decision-making in product design.

Fundamental to *VCD* is that *value* is personal and dependent on human thought. Thus, *value* is situated and subject to situatedness. The determination of *value* accommodates a person, situation, item, PVS and an assessment. An item is of *value* to a person, if the assessment done by the person indicates a certain degree of *need* satisfaction from the item under investigation. Thus, our current understanding of value is that *value* is the contribution to satisfy *need*.

Further research work is suggested on VCD requirements like *need* analysis, *value* based design goal definition, decision-making support, and the balance of enterprise, customer and society *value* related to a design artefact. A more detailed analysis is required on the assessment of *value* of an item, the perception of an item in context to the *value* determination process, *value* determination between people, shared value systems and shared criteria to determine *value*. A further issues is mentioned by Anderson et al. [2] pointing out concern about the validity of results obtained from present *value* assessment methods: "Respondents may be unwilling or unable to reveal the true *value* and there is concern of having the "right" individuals as respondents." This is similar to Griseri [13] arguing, "it might be difficult to identify what *values* someone really holds".

Within the scope of this research work, a more detailed model of our current understanding of *value in design* will be developed, including more detailed considerations on shared value systems. Current design approaches will be analysed against VCD requirements. Insights gained from research work will be tested via case studies in industry.

Acknowledgement

We are grateful to the thirty-two people who gave us their time to be interviewed. Without their support the work would not have been possible. We are particularly indebted to Georg Wessels and Armin Gruenewald of Unigraphics Solutions GmbH for supporting the research with the intention to deliver value to the enterprise, customer and society.

References

[1] Allingham M., 1982, Value; The MacMillen Press Ltd

[2] Anderson J.C., Jan D.C., Chintagunta P.K., 1993, Customer Value Assessment in Business Markets: A State-of-Practice Study, Journal of Business-to-Business Marketing;

[3] Andriesen D. & Deprez & Tissen, 2003, Value-Based Knowledge Management; Addison Wessley Longman;

[4] Andriessen R. & Tissen R., 2000, Weightless Wealth; find your real value in future of intangibel assets; end. London: FT Prentice Hall;

[5] Ashworth A. and Hogg K., 2000, Added Value in Design and Construction; Pearson Education Limited;

[6] Bailey S.; 1967, A Critical Dissertation on the Nature, Measure and Causes of Value; Augustus M. Kelley Publishers

[7] Bichan R.; 2002, Situatedness in Design: Situatendess affects Conceptual Design in a Team Working Environment; University of Strathclyde, DMEM;

[8] Bower M. & Garda R.A.; 1985, The Role of Marketing in Management; McKinsey Quarterly;

[9] Burns M.J. & Woodruff R.B., 1992, Delivering Value to Consumers: Implications for Strategy Development and Implementation, AMA Winter Educators Conference, Marketing Theory and Applications

[10] Clancy W.J., 1997, Situated cognition: on human knowledge and computer representation; Cambridge University Press;

[11] Feather T., 1959, Values in Education and Society, The Free Press;

[12] Fowler C.T., 1990, Value Analysis in Design, Van Nostrand Reinhard, New York;

[13] Griseri P., 1998, Managing Values; MacMillen Press Ltd.

[14] Hamilton A., 1996, Creating Value in Engineering, Thomas Thelford;

[15] Lapierre, 2000, Customer-perceived value in industrial context; Journal of Business and Industrial Marketing (15);

[16] Maslow A., 1970, Motivation and Personality, Harper & Row,

[17] McKinsey & Co & Copeland T. & Koller T. & Murrin J., 2000, Valuation; Measuring and Managing the Value of Companies; John Willey & Sons Ltd;

[18] Rokeach M.J., 1973, The Nature of Human Values, The Free Press;

Michael Reber, Unigraphics Solutions GmbH, 50674 Köln, Germany, michael.reber@ugs.com
Alex Duffy, University of Strathclyde, Glasgow G1 1XJ, Scotland, alex@cad.strath.ac.uk