MAPPING KEY FACTORS IN VALUE INNOVATION

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ABSTRACT
This paper investigates how value innovation occurs in product design by examining a number of case study projects that have resulted in innovative outcomes, in many cases leading to the protection of intellectual property. The paper explores the structuring of project specific design solution space and in particular the identification of key issues found to be cornerstones of the respective innovations. Many researchers have recognised the importance of 'problem framing' [1] described by Dorst and Cross [2] as 'crucial to high level performance in creative design'. In the terrain of the design problem referred to by Schon as the 'swampy lowlands' the creative designer tolerates a level of ambiguity [3] in order to create the space for innovation. This 'fuzzy situation' [4] is bounded by the cornerstones of the problem solution pairing. Whitehead [5] suggests that this 'span' can comprise up to 6 or 7 key issues and that the designer's choice of issues is key to the value of the potential outcome. The framing of problems using mind-mapping techniques [6] is explored firstly to appreciate the extent of the designer's solution space and secondly to consider the interrelationships of issues that subsequently proved key to particular innovations.
The paper concludes by offering general observations on the identification and mapping of key factors necessary for successful and distinctive value innovation.

Keywords: Value distinction, problem space, concept mapping, cognitive modelling, cognitive span, cornerstones of innovation.

1 CREATING VALUE THROUGH DESIGN

We might describe designing as a process of creating value for people. Expert designers take £1 worth of raw material – do design to it and make it worth £20. But how does this intellectual and emotional process of forming and organising come about and how can the process of generating value through design be replicated in new and different situations? 'Value engineering' [7] is a well-established concept that deals with the functional value of a product in relation to it's cost. The idea is that the value of a product can be increased either by reducing the cost, or increasing the functional value, or both. Designers however are not only concerned with the physical function of a product but also how it feels and what it means. Designers operate across all 'three worlds of mankind' [8] the physical world, the world of personal experience and the world of shared concepts. Thus when framing a problem the designer's attention must span different but interrelated aspects of value, these can be distinguished as:

- *Functional Value*, what a design does.
- *Experiential Value*, the users experience of how it does it.
- The *Value of Social Meaning*, the label we give it.

A design may be modelled and the outcome judged against one or more of these factors and the commercial value that arises may in turn be specifically protected as intellectual property (as illustrated in table 1).

2 MODELLING VALUE IN DESIGN PROBLEMS

Most researchers consider design method to involve the solving of ill-defined complex problems [9, 10] that comprise interrelating and interdependent aims. Such problems are neither clear nor ever fully understood by the designer who operates in a state of 'bounded instability' [11] framing the problem [1] in a way that maintains a tolerance of ambiguity [3]. As Cross demonstrates [12] such framing of problems is a key skill of the expert designer who instead of dealing with an objective is concerned with the more fluid concept of 'problem space' [13] that considers combination of value factors in relationship. Problem space describes the bounds of the problem and therefore frames the designer's attention without restricting creativity. In contrast with a process of deductive reasoning, this approach is more value oriented than objective oriented [14]. The cognitive modelling of problem space in the design process gives rise to a problem solution pairing where the understanding of problem and solution develop concurrently as part of the creative event [2]. If we consider value innovation in terms of the cognitive modelling of problem space i.e. arising from how we think about the problem, our creative potential relies on the tools, models and mechanisms we employ to focus our attention. English, Nathan and Whitcome's model (Figure 1) deals with the three aspects of value introduced above (Function, Experience and Social Meaning) in terms of; *What* is being designed, *How* it is being designed and t*he Context* for the design.

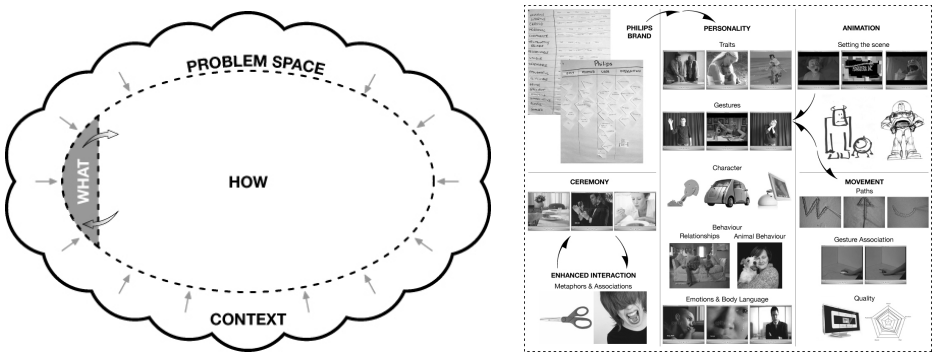


Figure 1: English, Nathan & Whitcombe (2006), Problem space diagram (left) and 'How' Plan (right)

In this model the functional value, or '*What'* part of the problem space is constrained in order to provide scope for the creative exploration of the *'How'* part i.e. the experiential value. So in their design for a steam iron Nathan and Whitcombe concentrate on *How* the user fills the water tank and adjusts the temperature rather than considering innovation in terms of *What* they are designing. The resulting design appears to gesture in a way that engages the user in different kinds of interaction intended to build a cognitive 'relationship' with the product. This led Young Nathan and Whitcome [15] to coin the term 'Productality' as a way to describe the perceived personality of a product.

3 COGNITIVE MODELLING OF PROBLEM SPACE

As DeBono points out [16] 'Creativity involves breaking out of established patterns in order to look at things in a different way'. Because design problems are complex, fluid and ill-defined designers need to find ways to focus their attention on precisely what

matters, at the same time excluding what does not matter. The designer 'requires means for filling in the new and for promptly eliminating large areas of alternatives which would be found not to meet his objectives' [7]. This involves both choosing the aims and issues that matter and creating ways of seeing these interrelating issues as problem space. Thus the 'Universal Form' of a design problem [17] 'occurs as an abstract perception of mind allowing the designer to model the particular physical form or interaction'. Designers use a variety of thinking tools to frame problems including, sketches, story boards mood boards and mental models. However the important key factors in value innovation are perhaps best communicated and understood in relationship through a process of concept mapping.

3.1 Concept Mapping

'Concept mapping is a unique technique for externalising the cognitive structure of the students. Using concept mapping students communicate on the level of the *whole picture* of the problem space, representing their prior knowledge and vision.' [18]

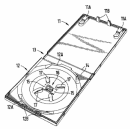
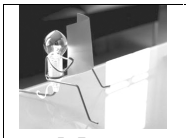
We can distinguish a number of distinct forms of concept mapping that often occur in sequence in the design process: *Radiant Mind Mapping* as pioneered by Tony Buzan [6] enables the designer to appreciate their own perception of a particular concept or issue by contextualising it relative to their own experience, judgements and assumptions. Such maps radiate from a single centre of enquiry and are often used at the start of the design process, enabling the designer to picture the entire design brief as a whole.

Starting with a radiant map it is possible to make other links between related issues by moving the centre of enquiry to any other concept in the map. Hence the radiant map becomes more integrated and can be considered not as a single enquiry but as a number of overlapping and interrelated enquiries. An *Integrated Mind Map* incorporates multiple centres of enquiry and can ultimately be described as a *Semantic Network* where each concept is considered as it's own centre of enquiry. *Integrated Mind Maps* and *Semantic Networks* provide a framework for designers to take a flexible view of the problem space, thus being free to move their own subjective viewpoint to any centre of enquiry. These tools enable the designer to see the problem in many different ways, creating many potential opportunities for innovation, however if a map develops too many centres of enquiry it may become too complex to usefully focus our attention. In this case we may compensate by choosing to see the problem or situation in a particular way. Whilst such a mental model [19] may help us to cut away complexity and focus our attention clearly, it can only provide a limited view of the problem and because it can be subconsciously led by our aims and assumptions the potential for innovation may in fact be reduced. There is hence a need to identify the cornerstones of our attention.

4 CORNERSTONES OF VALUE INNOVATION

The creative event requires us to hold the entirety of the problem/solution pairing as a snapshot mental construct, in other words, to picture the 'Universal form' [17] of the design problem. Bruner et al [20] state that this 'involves the elimination of irrelevancies where such exist or the evolving of methods of recording stimulus-events in such a way as to bring them within the compass of attentional or immediate memory span.' Whitehead [5] suggests that when considering a design problem we can only 'span' a maximum of 6 or 7 cornerstone issues and that the potential for innovation is dictated by how these slots are filled. Each cornerstone of innovation may relate to the value of function, experience or social meaning and the resulting design outcome can be characterised with a corresponding value emphasis as demonstrated in Table 1.

Table 1 Value Innovation Case Studies.

Property			Value			Design	Cornerstones of Innovation
Trademark	Design	Patent	Social Mng	Experience	Function		
						 1. IR Lighting	Low tooling budget Patented lens / reflector technology Sealed to IP 66 minimum Fast assembly Heat dispersal
						 2. DVD Case	Design for a VHS Video case manufacturer Springy Polypropylene material Nested cosseted treasured Push-button release Developing DVD Technology Very high volume
						 3. Baby bottle	Identify a quick route to a revenue stream Specialist inert plastic thin film materials Research into new joining techniques Starting a family Ease of use - disposable lack of after care Provide Individual dosage
						 4. Key Hanger	Smart storage Never forget your keys Character Personalisation
						 5. Lamp	Design for domestic lighting Minimal tooling costs Polished zinc plated steel wire construction Cute character – Play on words High cost/price differential
						 6. Door Stop	Door stop – shows forces and function One shot moulding Personality through character and name 'James' – Familiar Butler Minimal packaging "I beam" shape hints at weight
						 7. Coke Bottle	Coca-Cola bottle Classic American Spencerian script Heat wave Glass blowing technology Ingredients – identified Cacao pod in error

At the top of the table example 1 spans five purely functional cornerstones of innovation and hence the value of the resulting design is encapsulated primarily in what it does. As we move down towards the middle of the table functional value becomes more established and so the innovation represented by examples 2, 3 and 4 is described more progressively in terms of the sensory experience of using the product. Example. 5 begins to innovate value in terms of social meaning by using the play on words 'Reading light' and examples 6 and 7 draw on our deep-rooted associations projecting meaning onto the product. In 6 the strength of the I-beam profile reinforces the pose of the figure, in 7 the classic American script rides the more subtle associations of a Cacao pod shaped blown glass bottle developed during a heat wave. Table 1 suggests that as functional value is met, a space is created for experiential value innovation and that a designed experience can form the basis of the social meaning of the product. The table also points to a close association between different aspects of value and different forms of intellectual property. In legal terms a patent describes functional and mechanistic value, a registered design represents sensory and experiential value by focussing on aspects judged by eye and a Trade or Service Mark is concerned with the value of social meaning giving rise to the market perception of a brand.

5 CONCLUSION

It is important for designers to be able to model aspects of value as contributing parameters of design problems. This paper presents two simple value innovation concepts that used together can lead to the generation of commercially valuable intellectual property.

Firstly the idea of *Value Distinction* differentiates between functional value, experiential value and the value of social meaning. It is rare for a single design to exhibit significant value innovation in all of these categories and hence the concept may provide a tool to develop the richness of product value.

Secondly, *Cornerstones of Innovation* recognise the designers cognitive 'span' of up to 6 or 7 key factors that in combination frame the problem. By concept mapping cornerstones of innovation the designer is able to model problem space at an optimum psychological size.

By combining these concepts or tools we are able to bring value factors within the 6 or 7 cornerstone issues of our immediate attentional memory span to frame the problem in a way that releases potential for innovation.

Many modern products have developed a level of performance and reliability that makes them functionally almost indistinguishable from their competitors. The advanced nature of the market for some products has reached a level of functional effectiveness and reliability that leads consumers to base their purchasing decisions more on the value of the experience or social meaning offered by a product than on its functional value. A Porsche car for example might be seen as valuable socially and experientially. But in fact according to What Car [21] Porsche is the most unreliable make on the market, the most reliable being Skoda, a make which despite it's excellent reliability is viewed as a lower value option both socially and experientially. Thus we might aspire to own an expensive vehicle of relatively low functional value because of its high experiential and social value. The social meaning of a product can be a very powerful influence on consumer choices but this is often dependent on functional needs having been successfully met. The aspects of value discussed in this paper might therefore be best represented as a hierarchy since it would be implausible to attend to the value of social meaning of a product without first meeting functional needs.

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