

CRANFIELD UNIVERSITY

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Title:

**CUSTOMER DRIVEN IDEATION**

An Exploratory Study of Empathic Designs' impact on Industrial  
Design Practice

THE SCHOOL OF INDUSTRIAL AND MANUFACTURING SCIENCE

PhD THESIS

Cranfield University

School of Industrial and Manufacturing Science

PhD Thesis

Academic Year 2003-2004

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An Exploratory Study of Empathic Designs' impact on Industrial  
Design Practice

Supervisor: S. Evans

March 2004

This thesis is submitted in partial fulfilment of the requirements for  
the degree of Doctor of Philosophy

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## **Introduction: Abstract**

This research provides a study of practices of innovative ideation. The literature highlights the need for more radical innovation as drivers for customer delight, and more innovative approaches to understanding customers. However, both the theory and application, including the resultant practise describe and present a product-centred approach to innovation as best practise. Using an Action Research methodology within the Advanced Product Group of a well known automotive manufacturer; the technical centre of another well known automotive manufacturer and the industrial design department of a university, this exploratory and descriptive study contributes to the understanding and practise of more innovative approaches to customer driven ideation. Literature suggests that integrating customer understanding into the earliest stages of new product development was critical both to its effectiveness and its ability to innovate. This study, therefore aimed to investigate innovative ideation by considering two key factors:

1. Its integration into the early stages of the product design and development process
2. Industrial design practises of customer understanding

The research concluded on Industrial Design practise as well as the evolving practise of Innovative Ideation.

Industrial designers' participate in ideation processes and practices in a unique way, not fully represented or accounted for in existing prescriptions for integrating customer understanding. They require specific types of information, usually general in nature and presented visually. Information integrated into these practises is often substantiated with case study and example-based evidence or data. The potential to innovate is regarded as the single most significant motivator for designers to participate in customer understanding. Paradoxically, designers' processes use and rely upon 'product' as a focus for innovation and communication of design integrity. A designer's key role and most significant contribution, is in creative and strategic thinking: (new ideas: IDEATION): that is the integration of the actions of idea generation and the formulation of creative design responses; and the proposal of new concepts, which place a strong emphasis on increasing the desirability of 'product experiences' or new behaviours. This orientation of design considerations and the questions associated with them are particularly unique to industrial design disciplines.

They are systems based and holistic in their approach in order to prioritise customer needs within the design brief. An important early aspect is the identification of customer attitudes and activities, which broadens the design considerations.

This study relates these findings to an existing Empathic Design methodology and Kano's model of delight (1995), as identified best practice drivers for ideation. This study also concludes that 'Empathic Design' (it's theory, descriptions, definitions and practise) and product design as a discipline (its profile, uses and practise) need to evolve in order to embrace customer understanding as a pathway to innovation.

## **Introduction:** *Author Profile*

Richard Barrett graduated at Queen Elizabeth's School in 1993, but in his time there realised that design was not perceived by those intellectuals within a traditional educational environment as a subject to be studied by intellectuals. Nor was it a discipline capable of significant impact upon society. Richard had shown a willingness to question established traditions and the establishment itself in this most reserved of institutions. When considered alongside his inability to accept the way things are, this led to an increasingly developed interest in this most complex but stimulating of disciplines, that is always worthy of 'a rant' or further questioning.

After graduating in Product Design at the University of Hertfordshire Richard realised his influential limitations as a designer determined to make a difference, and the current shallow state of design and its reluctance to question its contribution to society or recognise its value, Richard was to seek accelerated pathways to easily persuade the design world to listen to his now more articulated 'rants' or questions.

Following a Masters at the Surrey Institute of Art and Design, and in spite of his design conscience, Richard grasped the unsettling experience of a PhD at Cranfield University. This involved enviable employment as a research assistant on CUPID (Customer Understanding Processes in Design); an IMI funded project in collaboration with Nissan and MIRA (Motor Industries Research Association). During this project and the parallel PhD research he has lectured at University of Hertfordshire on the Product Design Programme, uncovering valuable insights along the way.

These experiences have helped clarify his thoughts and ideas in a manner that leaves him richer for the experiences he has shared.

At the time of submission he has taken employment at the University of Hertfordshire where he will change the way a few people think about design. While there he hopes to balance his passion for design and his change peoples' view of design, by doing the interesting things for the right reasons. He leaves Cranfield University with fond regard for the place and the people who reside within it.

## **Introduction:** *Publications*

Burns, A.D., Barrett, R.L., Evans, S. and Johansson, C. (1999) Delighting Customers Through Empathic Design. Proceedings of the 6<sup>th</sup> International Product Development Management Conference, Cambridge, U.K. July 5-6 1999.

Burns, A.D., Evans, S., Johansson, C. and Barrett, R.L. (2000). An Investigation of Customer Delight During Product Evaluation Proceedings of the 7<sup>th</sup> International Product Development Management Conference, Leuven Belgium, May 29-30 2000.

Johansson, C., Burns, A., Evans, S. and Barrett, R. (2000) Delighting the Customer Across Cultural Settings. Proceedings of the Engineering Design Conference, Brunel University, June 2000.

Evans, S., Burns, A. and Barrett, R. (2002) Empathic Design Tutor. Copyright Cranfield University.

Barrett, R., Lindley, J. (2003) Longevity through Conception. Proceedings of Product Life and the Throwaway Society. Sheffield Hallam University, May 2003.

## **Introduction:** *Acknowledgements*

A personal thank you to my parents; without whom Steve wouldn't have had the 'privilege' and enlightening experience of trying to get me through a PhD. To Steve Evans, a supervisor who must want to throttle me by now, to Andy Burns, a person with whom anyone can have a 'rant' and of course to Louise, who is the sounding board for just about all of my 'rants'.

I must extend my warmest thanks to Mike Goatman and Julian Lindley who taught me just about all I know about design, well, except for the contents of this thesis. The students at the University of Hertfordshire who have been the subject of significant exploratory research, sometimes unwittingly. I have learnt as much from them as they have from me.

Finally, my thanks extend to Chris Sherwin who kept me at Cranfield through the troughs with his unusual brand of 'Stoke Humour' and to Suresh Paul, Ian Harris and Andrew Wolfenden, who have showed me how, the simplicity of Design really can make a difference on half a shoestring.

PS: To Dr Marinkowitz, now the Headmaster at Queen Elizabeth's School, And Mr Guthrie, of the same institution. Their advice to reconsider design, and branded the subject, 'Mickey Mouse', and could serve little real purpose in society. This thesis is, in some small part, their responsibility.



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### 1: *Introduction*

#### 1.0 Chapter Summary

This introductory chapter aims to set out the framework and scope: and the aims and objectives of the thesis. It begins with the background to the research and with a brief introduction to some of the core themes and concepts. The chapter will then introduce the scope, aims and objectives of the thesis. The final section will present the thesis structure through a brief chapter-by-chapter summary of the contents and aims.

#### 1.1 Background to Research

This thesis and the research on which it is based, explores the practises of customer focused idea generation within an industrial design context. An 'Empathic Design' approach; a concept still in it's infancy will be the primary vehicle for exploring customer driven ideation, specifically during the earliest stages of the industrial design process. The first proposals for an 'Empathic Design' approach were presented by Dorothy Leonard and Jeffrey Rayport in the Harvard Business Review, 1997 and as a recent proposition Empathic Design is little practised or understood. The definition of Empathic Design in its shortest form is 'the activity of bringing together the unarticulated needs of customers with the possibilities that can be realised by multi-disciplinary design teams'. This first articulation of 'Empathic design' as an activity that could be practiced can be attributed to two key sources: Alison Black of IDEO (Industrial Design Engineering Organisation) and Dorothy Leonard and Jeffrey Rayport, who in 1997 highlighted an opportunity for methods of customer understanding to spark innovation. These authors and their methods will be discusses in chapter 2 and throughout this thesis. This research focuses on the design dimensions of Empathic Design and how it can be integrated into the unique culture of industrial design. This research is undertaken from an industrial designer's perspective – what it means to practice Empathic Design and its motivations. This research identifies the characteristics of the practice of an Empathic Design methodology that may impact upon the strategic role of industrial designers. Empathic Design meshes with, and is informed by various external and related field of knowledge, such as design research, user-centred design, practises of industrial design, which will be presented in later chapters as the characteristics of the impact upon the industrial design process of Empathic Design emerge. As this chapter introduces the research, it begins with a

synopsis of the fields affecting customer understanding, the reasons for the conception of Empathic Design and presents a background to the research as well as stating initial motivations. This chapter will present research aims and objectives and will conclude with the thesis structure.

The aims and the subject of this research falls within the domain of design research. Its aims are to explore and expand the theoretical field of design and provide insights into the practises of designing. Having an empirical basis within a case study extends the research into the domain of design management, as many of the findings relate as closely to the organisation and management of design as they will to the practise of industrial design.

### 1.1 Introduction to Research

#### 1.1.1 Design and Product Development

Design: A process (designing); a profession (designer); an outcome (design). Dilnot, 1998 suggests that design as a term is now confused, misunderstood and misused. Design has become a fragmented discipline supplanted by an array of skills that continue to obscure the principles of innovation. Design is often associated with the conception, planning, developing and detailing of products for manufacture (industrial or product design). For the purposes of this research, the perspective of the industrial designer will be the primary focus, and further focus will be in the earliest stages of the industrial design process. The latter 20<sup>th</sup> Century has seen industrial design (the design of products for mass production) shift towards usability, desirability, visual appeal etc. normally driven by increased consumption (du Gay et al, 1997). Industrial design continues to shift ever closer to the customer and usability related design aspects with product design and development. Myerson, (1995), also cited in Sherwin, (2000), maps significant roles of design, highlighting its many contexts, often highlighting its inherent contradiction:

“Design for Business; Design for the Real World; Design for Profit; Design for Society. Here are four phrases that describe the changing role of the designer in the post-war years – and chart the often schizophrenic positions that the international design professions occupies as it weaves between the obedient servant of the client, commerce and consumerism on one hand, and the ethical champion of broader social and cultural concerns on the other” (Myerson, J. 1995), also cited in Sherwin, 2000.

These understandings of the nature, purpose of design will significantly impact upon ones design ethos, and shape approach, and practise. By definition, this will also influence (and perhaps constrain) the application of industrial design to broader drivers for innovation. The interpretation of the term 'design' by the varied participants of this study will, therefore inform the process of, and culture of ideation and innovation when considering the outcomes as catalysts for customer experiences across disciplinary boundaries.

### 1.2 Industrial Context

The research study that will be described in this thesis was conducted with the collaboration of three organisations operating within the automotive sector, each contributing during different phases of the research. All three organisations were interested in how customers could be delighted through the improvement and development of the industrial design process (and the subsequent products). The research to be presented in this thesis is a contributing element of a funded research project; CUPID (Customer Understanding Processes in Design), which aimed to deliver and test tools and methods that industrial designers could use to develop a deeper understanding of their customers. The CUPID project was funded by the UK Governments Innovative Manufacturing Initiative and the methods, tools and guidance are presented in supporting publications; 'The Empathic Design Tutor' (Evans et al, 2002). As a necessary contribution to this larger research project, the research to be presented in this thesis upon the integration of customer understanding into an industrial design process and the impact of customer understanding upon ideation and the earliest stages of a new product development process. The research was also set against a concurrent period of industrial activity focussed on the increased understanding of customer experiences as drivers for innovation and customer delight. In 2001, the UK Design Council ran its annual 'Design in Business Week' with the explicit focus "Delight your Customers" (Decker, 2002). This research collaborated with DIBW during 2001 and 2002 in order to increase awareness within UK industry.

#### 1.2.1 The CUPID Project

The CUPID project was proposed as a research project that formed part of the 'Foresight Vehicle Programme', funded by the 'Innovative Manufacturing Initiative'. It was proposed to service a specific industrial problem with sector-wide implications. That is organisations within the automotive sector attributed significant



'late design changes' to poor delivery of designed innovations against customer needs. This project proposal did not initially articulate that customer delight could come from the understanding of latent and tacit needs articulated by Leonard and Rayport (1997). The CUPID project was primarily focused on the current industrial paradigm that advocated Quality Function Deployment as a robust mechanism for translating customer requirements into the earliest stages of new product development. This research conducted as part of the CUPID project and this research study was able to identify Empathic Design as a current advocated approach to understanding that could be explored and developed. Within this thesis the CUPID project will be identified closely with a number of tools and approaches investigated and developed as part of this research study.

The CUPID project had two clear objectives when considering delighting customers:

- To identify and develop mechanisms by which designer involved in the earliest stages of new product development could better understand their customers.
- To develop methods for delivering increased product quality driven by deeper customer understanding.

These objectives differ in one key area from this research study. That is that whilst CUPID focuses primarily on identifying and developing methods for increasing product quality, this study focuses on the understanding and development processes that can be adopted by industrial designers to better understand customer experiences and deliver design responses. It is clear, however, that both this research study and the CUPID project are concerned with the earliest stages of new product development.

### 1.3 Research Motivation

Several observations and considerations motivated this research. The research was initially motivated by one overriding dichotomy, that the researcher was not able to fully articulate. This research has in fact clarified this dichotomy. This centred on several identified questions within this research study. The author has been driven by the propensity amongst industrial designers to accept their intellectual contribution should predominantly be communicated through the design of artefacts, and that the subsequent frustrations of the failure to recognise the strategic role designers could play in the development of customer experiences. The author considered that innovation could be greater influenced

by industrial designers if they were involved earlier in the product development process. The context of this study presented the author with the opportunity to understand this context and the conditions that can elevate the role of industrial design so that the author can, in future, play a strategic role in product definition. A passionate desire to understand the activities that can drive radical innovation through the eyes of an industrial designer has contributed to the author's involvement in this research project. This project has been strongly influenced by the author's industrial design background and training. The focus of developing a methodology that can be readily applied to the working practise of industrial designers has emerged from the author's desire for industrial design to participate in the questioning of current customer paradigms.

### 1.3.1 Limitations of Current Literature and existing theory

Whilst presenting the research aims, objectives and usefulness to the practise and theory of industrial design it is equally important to stress the limitations of this research. Key limitations are highlighted below:

- This research emphasis is on customer understanding within the earliest stages of a product development process, drawing conclusions and generalisations about an Empathic Design approach to product design and development. Much of this research used customers as innovation levers and as primary drivers within the ideation and concept development phases of product design and development. All design activities cannot focus upon customers in this way as they carry the complexities of specific commercial paradigms. For the purposes of the research projects, the importance of customer understanding during the ideation process is overstated.
- Similarly, this research looks at developing an understanding Innovative Ideation. The processes of ideation that are focused on the delivery of 'breakthrough Innovations'; (driven by customer understanding). Usually, design responses in this context are characterised by the generation of new product concepts and initial design proposals. Industrial design cannot always result in new or concepts, often redesign is required. For the purposes of this research the innovative aspect of the ideation process is emphasised.

## 1.4 The research approach

The focus of the research was determined by both the industrial context, and a review of literature.

Implicit in these research objectives, was the need to understand the nuances of industrial design practise. Throughout this research the practise of innovative idea generation and concept development is referred to as 'Innovative Ideation'. Though this research investigates deep customer understanding as a focus for 'breakthrough' innovations of a more radical nature (in terms of customer experiences), the purpose was not to create 'innovations'. The emphasis is therefore on the innovative practise of designing and the design process, than on the development of products.

### 1.4.1 Research Objectives

There are fundamental issues affecting the adoption of customer understanding during the product development process. That is, although industrial designers are recognised as playing an important role in ideation and concept development, and there is an identified need for industrial designers' to develop a deeper understanding of customers' specifically in the earliest stages of the product development process, they lack appropriate mechanisms or methods to embrace this evolution. By developing a deeper understanding of the ideation and concept development processes from an industrial designer's perspective, it is an objective of the researcher to develop methods capable of supporting customer understanding from an industrial designers perspective and within the early stages of an industrial design process. The specific objectives of this research are:

1. To critically review literature and further secondary sources relating to:
  - The nature and culture of the profession of industrial design
  - The emerging nature of industrial designers' involvement in the process of customer understanding
  - The emergence of an Empathic Design approach as an avenue to spark customer focused innovation
  - The relationship between the Kano model of customer satisfaction and an Empathic design approach to innovation.
2. To investigate an industrial designers' use of customer understanding during ideation and concept development processes.

3. To develop a framework upon which future customer focused ideation methods intended for industrial design processes can be used.

These objectives are met through the collection and analysis of empirical data (described in chapter 3).

#### 1.4.2 Research Questions

- How does an 'Advanced Product Design' team (involved in the earliest stages of new product development; pre-concept), integrate customer understanding into their design process?
- How could industrial designers conduct customer-focused design?
- How do designers participate in 'customer understanding' processes?
- What are the characteristics of the earliest stages of customer-centred industrial design?
- How do industrial designers communicate customer understanding across design teams?

#### 1.4.3 Research Deliverables

This thesis aims to present a number of deliverables:

- A developed Empathic Design Methodology that facilitates 'breakthrough' (those that engender changes in customer behaviour) innovations through increased customer understanding by industrial designers, which will:
- Develop an understanding of industrial designers' needs when considering methods to facilitate the integration of customer requirements.
- A contribution to knowledge through the presentation of a developed Empathic Design methodology applicable to an industrial design context and based on the further understanding of customer needs and the nuances of the ideation process.

#### 1.5 Scope and Limitations of Work

The scope of the research project presented in this thesis is relatively wide. It focuses on the work of industrial designers involved in the earliest stages of new product development. It also has deeper industrial involvement with work and design practice and processes within an automotive design context. During this research study, collaborative companies existed, and

comprehensive ranges of data sources were available through reasonable access to collaborative companies. It is important to recognise that the researcher is aware that the project would benefit from a broader scope; that is beyond the automotive sector. The researcher was able to ensure that information regarding the nuances of industrial design processes within these contexts could be gleaned.

### 1.5.1 Research Novelty

This research seeks to generate new knowledge in the form of:

- The exploration of customer understanding within the context of industrial design practise – and within the previously ignored pre-concept stages of new product development
- It moves the discipline of industrial design into earlier stages of product design and development (pre-concept), and (pre-design brief)
- Develops an Empathic Design Methodology to spark 'breakthrough' innovations

### 1.5.2 Contribution to Knowledge

This research aims to make the following contributions to knowledge:

- Knowledge of industrial design practise through an exploratory study of the practise of Empathic Design in true context.
- Developed understanding of specific practices of customer understanding as conducted by industrial designers.
- Advance understanding of customer understanding and its impact on industrial design innovation practice.
- Industrial experience of pre-concept integration of customer requirements, advances understanding in the management of the earliest stages of industrial design practise.

## 1.6 Guide to Thesis Structure

This thesis is divided into three main sections: a literature review; pilot study; and main study. Throughout the thesis, the nature and aims of the research shift to reflect the exploration of industrial contexts and changes the author seeks to describe in the main study of the thesis.

### 1.6.1 Chapter 2: Literature Review

The literature review has two main focuses: the review of industrial design and related subject matter; introduces and reviews the industrial context for the drive for the research. Highlights current best-practise with regard to customer understanding as a driver for innovation and introduces industrial design as a disciplinary context.

#### 1.6.1.2 Chapter 3: Research Methodology

Presents the research strategy and proposes the research design. It describes the methods the researcher has selected and articulates methodological decisions. This chapter also presents the proposed data collection and analysis techniques together with the mechanisms for implementing those techniques, and justifies the approach taken. It considers the issues of bias and validity and presents a summary of the research design. This chapter also identifies weaknesses in the approach to the research and measures taken by the researcher to alleviate these weaknesses.

### 1.6.2 Chapter 4: Exploratory Pilot Study

An initial pilot study was conducted with the collaborating companies of the CUPID project and the university department involved in this research study. This was undertaken as a live design project and supported by industrially grounded workshops set alongside the CUPID project. Designers worked on the development of customer focused design concepts, specifically adopting an empathic approach to support idea generation and concept development. This allowed a methodology to be developed as well as to build a relationship with the cases in question.

Research questions for the exploratory pilot study:

- How does an 'Advanced Product Design' team (involved in the earliest stages of new product development; pre-concept), integrate customer understanding into their design process?
- How do designers participate in 'customer understanding' processes?
- How do industrial designers communicate customer understanding across design audiences?

### 1.6.3 Chapter 5: Prototype 'Empathic Design' Methodology Development

The initial findings that emerged from the exploratory pilot study allowed the researcher to develop a number of hypotheses. Based

on these findings and empirical data, a prototype methodology was developed as a mechanism for testing these hypotheses and to facilitate the application of an 'Empathic Design' methodology to Industrial Design practise and that is sensitive to an industrial design context. This prototype methodology was developed in order to characterise the impact of 'Empathic Design' on the ideation process and as a mechanism for sparking 'breakthrough' innovations through its practise.

### 1.6.4 Chapter 6: Main Study

The main study represents the major work within this project and its main contribution to industrial design practice. It takes key findings from the exploratory pilot study, and develops the empathic design methodology with a view to testing and validating those findings for the purposes of expansion and application. The data from the main study comes from a number of projects, and project collaborations with reference to consistency and generalisability. The data is analysed and presented with reference to key research themes developed throughout this work. It is related to current literature and practise with the aims of building theory.

Research questions for the main study:

- What are the characteristics of the earliest stages of customer-centred industrial design?
- How do industrial designers conduct customer-focused design?

### 1.6.5 Guide to Chapter Structure

This thesis consists of seven chapters the content of which is summarised below:

Chapter 1: introduces the research, providing a brief summary of the subject area and describes the background and motivation for this research. It presents the scope, aims and objectives of the research and concludes with an outline of the thesis structure.

Chapter 2: the literature review explores the literature surrounding the practise of industrial design, its culture and context. It presents customer understanding as a pathway to innovation, and innovation as a pathway to customer delight. It pulls together industrial needs, current best practise and reviews current model of customer satisfaction. It demonstrates current state of the art understanding regarding industrial designers in customer understanding, and

identifies the research questions in order to understand and develop 'innovative ideation'.

Chapter 3: Research Methodology; the research strategy, design and methods are presented. This chapter also presents data collection and analysis techniques, and justifies the approach taken. It considers the issues of bias and validity and presents a summary of the research design.

Chapter 4: The Pilot Study – introduces the pilot project and the supporting workshops that are aligned to the industrially grounded research projects that this research contributed to. It collected empirical data in order to develop a deep understanding of the subject areas specifically related to the research questions. This exploratory pilot study provides some early findings that emerged and goes on to present a number of hypotheses which were developed from these findings as well as a methodological framework on which to base the main study.

Chapter 5: Presents the prototype 'Empathic Design' methodology, proposed and developed to better understand the role Empathic Design plays in the earliest stage of an industrial design process.

Chapter 6: the main study is introduced, and the hypotheses generated in chapter 4 are then tested through the development and testing of an Empathic Design methodology in an industrial design context and the emergent empirical findings.

Chapter 7: undertakes Discussion and Theory building and relates the research findings back to the literature with the aim of building new theory and contributing new knowledge. This includes the development of a framework for applying this theory across industrial design practise. It then highlights additional findings that have emerged during this research and presents the research conclusions, and makes suggestions for further work. It reflects on the research objectives and presents contributions to knowledge made by this study.



### 2.0 Literature Review

#### 2.0.1 Introduction

This chapter will provide an overview of significant and relevant design literature. It will demonstrate how industrial design as a discipline fits into a wider design context and demonstrate how an industrial design process is informed, practised and communicated across design platforms. This chapter will also acknowledge literature that calls for organisations to better understand customers; the conception of this literature, and the role industrial designers can play to embrace this call.

#### 2.1 Background to User-centred design

User-centred design is often the term referred to as current best practise when considering the integration of end users in the new product development process. Asking leading practitioners how users are involved in an industrial design process will develop an understanding of the methods employed by the industrial design profession in order to better understand those people that will be engaging with their designed products. Or will it? There are a raft of methods employed by design teams at the forefront of industrial design practise. These may be aligned to industrial design practise, or require the deployment of a multi-disciplinary team. IDEO are an industrial design, innovation and interaction consultancy at the forefront of approaches to observing customers and practice 'customer immersion'. That is, they employ specific methods aimed at deepening their levels of customer understanding and integrating this understanding into their ideation processes. The IDEO example is not isolated. David Humphries at PDD (Pankhurst Design Development) and a collaborative project that culminated in 'Presence Lab' provide examples that have similar identities in that they both consider the end user as the focal point of their design processes and drive those processes through the provision of specific methods of deepening customer understanding. Empathic Design as a new approach to sparking innovation by driving it from a basis of intimate customer understanding emerged as exactly that: a driver for innovation: a methodology solely aimed at bringing together designers and customers to deliver against the latent and tacit needs of customers. The first articulation of 'Empathic Design' by Leonard and Rayport considered that there were leading edge designers and design teams already practising a customer driven approach to design. IDEO is the most illustrious of these design teams and is cited by Leonard and Rayport. IDEO

brands itself as an innovation rather than a design consultancy, and the methods employed in its 'Deep Dive' approach (IDEO corporate video, 2001) closely resemble those proposed in an 'Empathic Design' approach. The Methods Lab, Produced by the Presence project in collaboration with IDEO and developed in 1999 highlighted the first attempt to build a series of methods capable of understanding specific customer interactions. It must be noted though that these methods should be regarded more as tools since they prescribe actions and corresponding results. Why then, is this process not transferable across the industrial design discipline? The 'Method Labs' currently only presented by IDEO and Presence relies on intuitive practises by industrial designers to connect 'customer understanding' methods with concept development processes. Methods are presented by both IDEO and Presence that facilitate customer observation, and provide stimulus for brainstorming activities. They also propose methods for integrating customers in concept testing. There is however, a process that takes place intuitively by industrial designers in between these two proposed method groups, where customer focus and the opportunity for 'breakthrough' innovations may be lost. This process will continue to be regarded as 'Ideation' throughout this study.

'Ideation': The integration of the actions of idea generation and the formulation of creative design responses.

This study will be concerned with the processes of ideation and the methods adopted by industrial designers to facilitate the creation of radical design responses during those processes. This study will also investigate the impact of Empathic Design on the relationship between the creation of radical innovations and those processes.

### 2.2 Need for customer understanding

Why is 'customer understanding' so important? In a world where technology-push often drives innovation, designers are asked to address new questions that have traditionally been outside the remit on the industrial designer. As a consequence, industrial designers have articulated concerns that current products are unsure of the questions they're answering.

'All too often the purveyors of new technology are providing really excellent answers – but to the wrong questions. This produces a whole variety of solutions to problems that nobody has. The real challenge seems to be knowing how to ask the right questions in the first place...' (Hummels, C., Overbeeke, K., 2000)

Hummels continues to propose a significant shift in product perceptions. There is an implication that this change shifts the role of the designer from designing products to designing contexts for experience. Significantly, this evolution of the role of design is not new. "At Philips, we considered products as catalysts to a wider experience... there must always be more, but you identify with a product". (Goatman, M. University of Hertfordshire 1999). Though this perception change is unique in that it addresses the role of the industrial designer directly, it remains product specific.

This literature review will draw comparisons with the ecodesign literature as it shows significant strategic similarities as an innovative and emergent area within design practise. As Designers asked different questions, so their role within a design development process changes. Not only does it become more strategic in its nature, but the influence and level of contribution is elevated to reflect the new questions a designer is asked to answer.

(Bakker, 1995 (p43)) recognises two distinct roles for Industrial designers. These are described as:

The operational role: the industrial designers task is to translate a product idea into a concrete product.

The strategic role: Due to changing conditions in companies, designers' tend to become more and more involved in the strategic phases of the product development process. Though this refers to an industrial designers role with respect to ecodesign, similarities can be drawn across emergent roles as they evolve for industrial design practise.

(Sherwin, 2000) further emphasises the significance of this change with respect to ecodesign innovation rather than customer driven innovation. It should be noted that the evolving role of the industrial designer is likely to give rise to new questions with a multitude of drivers. Customer focus has already been demonstrated as significant in previous literature.

### 2.3 The role of Ideas: (creative and strategic thinking)

Among the most significant and important contribution for industrial designers is creative and strategic input and thinking, the proposal of new ideas and solutions via various alternative solutions.

The greatest level and types of engagement by Industrial Design is towards the more strategic forms of ecodesign innovation, proposing new product concepts (innovative) rather than the redesign of existing products (incremental). This contribution diminishes towards the more operational role.

### 2.3.1 Calls from Industry

Calls from industry, particularly from within the automotive sector and the design council, highlight a need for designers to better understand users. These calls further highlight lack of robust methodology and the dichotomy between the business requirement for defensible customer understanding and the designers' natural tendency for inductive and informal research methods and techniques. In addition, Presence (1999) suggests that communication between the user and the design process is key. It draws in to question the reliability of communication with the designer, but falls short of proposing robust methods for facilitating this dialogue beyond immediately observable interactions.

*"To prosper in the 1990's, [companies] have to go a step further, to delight customers with wonderful products, outstanding value and superlative service. Genuine delight stems from giving a customer something wonderful that they didn't even know they wanted until they saw it."*, (Schumann et al, 1995).

"...we must take quality beyond customer satisfaction to customer delight." Colby H. Chandler, CEO, Eastman Kodak (cited in Chandler, 1989).

"Customers must experience delight and surprise, and that means delivering what they want which does not necessarily mean what they think they want.", (Randle, 1998).

"Products must excite customers or be banished.", (Buitoni, 1999).

"Designing to surprise and delight customers is the least understood factor in designing for hit products.", (Nussbaum, 1993).

"If we hope to recapture market share we can only do it by exciting our customer. One of the ways to do that is by giving him more than he expected. Value excites customers.", (Anonymous General Motors Engineer, Ludvigsen, 1996).

There is considerable strength of opinion across industry sectors. Critically, the views presented perceive delight as an extension of satisfaction. However, perhaps paradoxically, customers are delighted when they get the unexpected, (or more than they expect). Delighted customers are excited, and this excitement is associated with surprise. Industry defines delight as 'exceeding customer expectations', (Rogers, 1999; Malecki, 1999).

Taguchi suggests that 'customer Quality' (the characteristics that customers are looking for) is within the domain of concept designers. This suggestion ultimately recognises that the key to quality is to come up with good concepts in the first place. (Taguchi, 2000 cited in burns 2003).

(Burns 2003) Highlight's The Kano Model as the preferred model adopted by both practitioners (Hoffmeister et al, 1996, Ungvari, 1997, Jacobs, 1999, Plsek, 2000 and Garside et al, 2002) and academics (Clausing, 1994, Bergman and Klefsjo, 1994, Matzler et al, 1996, Dimancescu and Dwenger, 1996, Matzler and Hinterhuber, 1998 and Shen et al, 2000). Citing that this Kano model is the first that does not assume a one dimensional relationship between quality and customer satisfaction. In the industrial domain its real importance rests with the complexity of the dependence product quality has on the needs and expectations of customers.

## 2.6 The Kano Model of Product Quality

The Kano Model plots the level of achievement of a product quality against the level of satisfaction experienced by the customer. The Kano model consists of three key components:

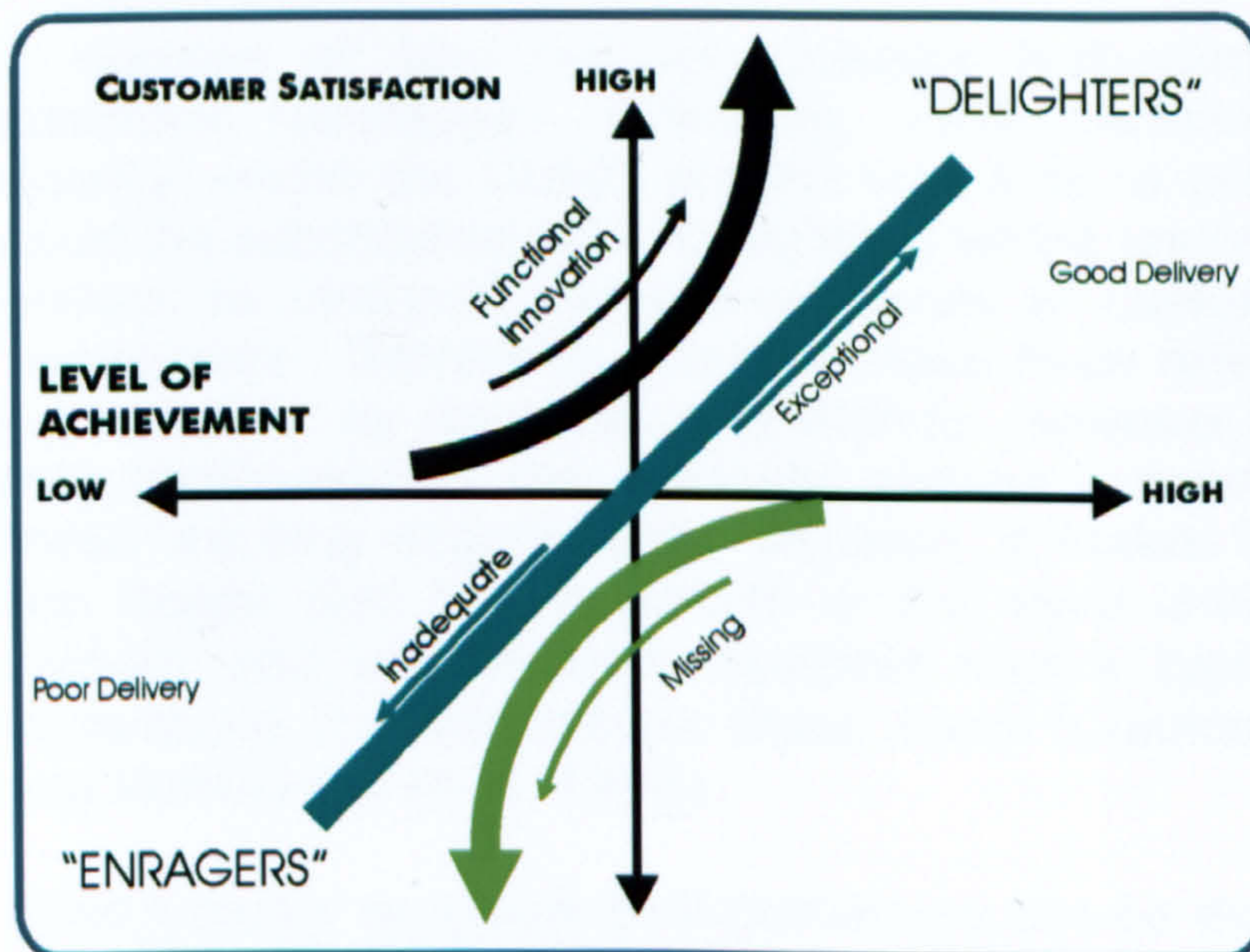


Figure 2.6: Kano Model of Customer Satisfaction (1995)

Kano identified three types of product attributes:

Basic (Expected): Customers are often indifferent to these qualities or features when they are present, but become intensely dissatisfied when these attributes are absent. Kano suggests that these attributes must be delivered and are expected by customers.

Implication: Once a certain level of attainment is reached increased quality will not greatly increase satisfaction.

Linear: Increased levels of these qualities increase levels of satisfaction felt by the customer. Kano suggests that the level to which these qualities or product attributes are achieved corresponds directly with satisfaction felt by customers.

Attractive (Unexpected): Satisfies customers by its mere presence. Significantly, the absence of these qualities does not dissatisfy customers, as they are unexpected. However, the presence of these qualities or attributes has the propensity to surprise and delight customers.

The final component of the Kano model accounts for the shift in customer expectations over time. Kano highlights attractive qualities of today as tomorrow's linear and basic qualities.

### 2.6.1: Interpretation of The Kano Model of Customer Satisfaction

A number of key authors consider Professor Kano's model of customer satisfaction. (Clausing, 1994), acknowledges 'Attractive Quality' whilst the CUPID project was able to demonstrate that this could be substituted with 'Delighter', whilst (Hofmeister et al, 1996) prefers to interpret exceptional levels of customer satisfaction as 'excitement'. 'Attractive qualities' have been referred to as 'exciting experiences' by bergman and Klefsjo. However, they also suggest that technology as the proposed avenue is most likely to generate these 'exciting experiences', because "it makes it possible to satisfy the needs that the customer is not even aware of". Other key authors and practitioners interpret Kano's typology as functional innovations that will answer these needs (Clausing 1994, Kano 1995 and Hofmeister et al, 1996).

Kano's model proposes that customers can be delighted in two ways and it should be noted that both are based on relative expectations: firstly, provide higher than expected achievement of attributes that customers want or need (linear), and secondly, provide unexpected functions that prove attractive through surprise. These interpretations of Kano's model imply that one pathway to innovation is to uncover the latent needs of customers, and use these insights to design more functional innovations that will

surprise and delight. In short if a company achieves all basic functions, delivers existing wants to a high standard, and also delivers unexpected features that customers never knew they needed. Then customer satisfaction can be maximised.

“Designs of current products which rely on trends and uniqueness are wearisome and will soon be a thing of the past”. (Inagaki, 1993).

Empirical evidence and evidence from industry has highlighted the need to go beyond satisfaction and extend into customer delight. Furthermore, practitioners highlight design, specifically product design as a likely avenue to achieving this through exceeding customer expectations. The most recent definitions of product quality clarify the influences ‘expected’, ‘wanted’ and unexpected product attributes have on customer satisfaction. The implication of these proposals is that products can exceed customer expectations by excelling in the provision of qualities that customers want and by answering the latent needs of customers so that the customer is surprised by the unexpected ‘functionality’ of the product.

### 2.7 Customer understanding and design drive innovation

The Design Council, UK, argues that many industry sectors have yet to realise that product design is the key to realising customer delight. A national survey conducted in 2001 highlighted that 85% of businesses approached by the Design Council said they “aimed to delight their customers by surpassing their expectations”, (Dekker, 2002). The literature shows that customer delight is regarded as important across industry sectors, and that design, specifically product design is a key activity in achieving that delight.

(Schumann, 1995), highlights three types of customer who may be delighted – we can propose that this can be attributed to design-led innovations.

**Current Customers:** Likely to be satisfied by relatively small, incremental improvements. Schumann cites Gillette as an example of delight through organisational improvement.

**Aligned Customers (identified potential customers):** Unlikely to be satisfied by incremental improvements, as they are likely to have relationships with competitors. Significant improvements will therefore be required as attractors, ‘distinctive innovations’. These are termed ‘aligned’ customers. However, and as with existing customers, aligned customers are unlikely to be attracted by those

'disruptive innovations' which require them to make significant behaviour changes.

New Market Customers (unidentified potential customers): these customers are likely to be attracted by disruptive or breakthrough innovations, which offer significant differences with regard to existing paradigms (Schumann et al, 1995).

It is not enough that customer understanding drives innovation, but how. In mature markets that become standardised, differentiating 'wow' factors become more difficult to achieve as customers demand more radical innovations in order to differentiate experiences that are often perceived as almost identical. (Middlebrooks, A.G. 1999) also cited in (Burns, A.D. 2003).

"Most truly revolutionary products and services come out of understanding latent needs. Because latent needs are so subjective, it is essential that every function participates directly in gathering and interpreting them", (Rosenberg & Thompson, 1993). These authors consider that poor customer focus leads to inefficient and often technology driven pushes for design without consideration for the impact upon customer experiences.

Thomas argues that the very systems that drive customer focus, those reliant on numerical data to track customer satisfaction, leads to a 'quick fix', rather than a deeper understanding of customer experience that may address deeper values associated with those experiences. In short the richness of experience is lost in the very system charged with understanding it. "Super-satisfying and retaining customers requires more than just their input; it also requires their involvement", (Thomas, W. 1998).

### 2.7.1 Brezets' model of Ecodesign Innovation

Brezet (1997) proposes a model of Ecodesign Innovation that could also be applied to customer-focused innovation: this model consists of differing design criteria and considerations. The four steps are modified to apply to customer understanding and summarised below:



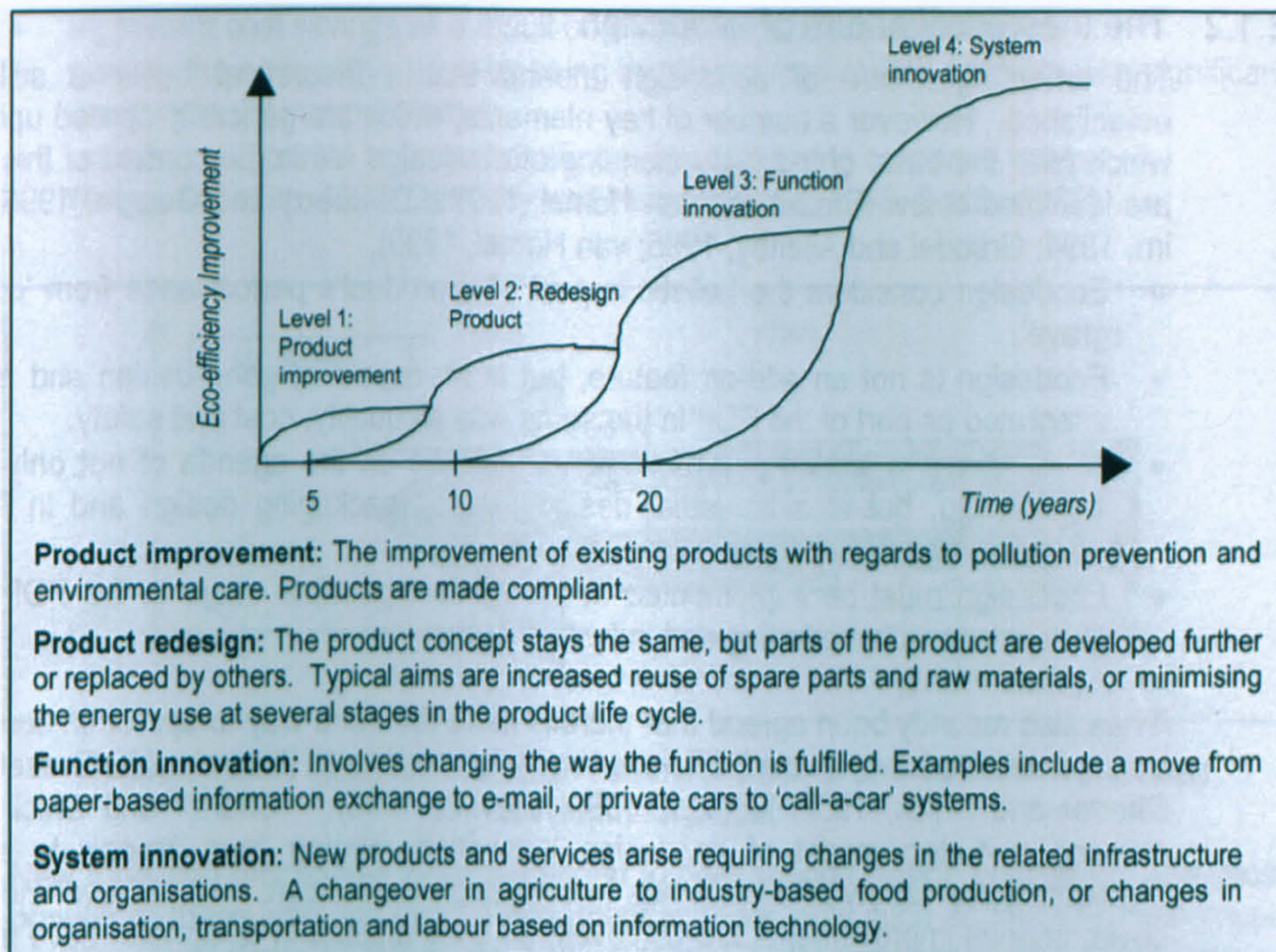


Figure 2.7 – Four Stage model of Ecodesign Innovation (Brezet, 1997)

**Product improvement:** the improvement of existing products with regard to specific design and/or performance targets; likely to yield incremental improvement

**Product Redesign:** The product concept remains the same, but product characteristics are improved for example people product interface: likely to yield a greater level of product specific improvements

**Function Innovation:** changes the way in which functions are fulfilled. Will certainly affect customer behaviour and modify the way in which customer activities are conducted. For example; a shift from private cars to a 'call a car' system.

**System innovation:** the conception of new products and services arise requiring significant changes in behaviour on the part of customers and organisations alike. These create new customer paradigms and require changes in related infrastructures and organisations.

This model has been interpreted and modified by others to accommodate other factors such as contexts: (Stevels, 1997).

How can industrial design be employed strategically to direct 'customer understanding' and innovation throughout the early stages of new product development?

2.7.2: Charters interpretation of Brezets' Model of Ecodesign Innovation:

Charters interpretation of Brezets' model could also be served to advocate radical innovation as opposed in incremental improvement. Consider late design changes:

"To move beyond re-design to re-think will require significant leaps in thinking driven by the emphasis on creative problem solving" (Charter, 1998). Interpreting this model with a view to its application in customer satisfaction, suggest that creativity could be fuelled by intimate customer understanding, and coupled with mechanisms to unpick the underlying needs of customers. This alternative application of an existing model could provide a catalyst for radical innovations that are also consider minimising those characteristics that give rise to 'disruptive' rather than 'breakthrough' innovations.

2.7.3: Manzini's principles and strategies:

Manzini is credited with significant and advanced thinking in both the theory and practise of ecodesign. Moreover, some of this thinking can be applied across design practice and with an altered primary focus. In this case his drive towards fostering more radical innovation is specifically relevant to the development of methods that feed into this enquiry. These concepts include:

'forecasting' : projecting forward from where we are today

'backcasting' : Working back from a desirable future situation or scenario

This can be applied to customer driven innovation, specifically with relation to the creation of scenarios and the shifting of customer paradigms. A similar and related concept is 'the leapfrog strategy' (Manzini 1997) in which more radical innovations are sought that 'leap over' current and incremental innovations. This is consistent with the approach to innovation adopted by IDEO (Black, A. 1998). IDEO highlight scenarios as a technique for projecting existing challenges into the future. These scenarios, however are fundamentally driven by products and though based on direct observations, these observations respond to product interactions and product experiences.

"Most of the literature from the last fifty years would have us suppose that the main function of design is to make things beautiful. A few studies suggest that it is a special method of problem solving, but only occasionally has design been shown to have something to do with profit, and even more rarely has it been

seen as being concerned with the transmission of ideas.” (Forty, 1986, p.6)

Forty also links design to the promotion of ideas; value systems throughout history. He also highlights how design was used to embody and express key notions: For example, Health and cleanliness in Victorian England as a notion (intangible) was implemented and made tangible through a design catalyst.

### 2.8 Introduction to Empathic Design

Defined by Leonard and Rayport (1997) as ‘gathering, analysing and applying information gleaned from observation in the field’. And practiced by IDEO as a method of managing inspiration and empathy.

The fundamental techniques of Empathic Design; that is the gathering, interpreting and applying information gleaned from observation in the field, are not common practice. Those practitioners that are set up to employ empathic design have found that the techniques requires for this practice require unusual collaborative skills that are achieved through the “recruitment of great designers” – characterised by Alison Black of IDEO (1998). Empathic design highlights the use of visual information as stimulus to spark innovation and highlights direct observation by designers as key to uncovering insights regarding the latent and tacit (real, rather than perceived) needs of customers as an antidote to conventional research inquiries that gather data in relative isolation from other disciplines; empathic design as a proposition demands creative interactions among members of an interdisciplinary team. This is further illustrated at IDEO, where multidisciplinary teams are a requisite for customer understanding and ideation processes. (IDEO ABC Nightline, 1999)

### 2.9 Background to Empathic Design

#### 2.9.1 Defining the conception of Empathic Design

Empathic design embraces the notions of continual innovation and the meeting of a real – or perceived – customer need. In its initial articulation by Leonard and Rayport (1997) The mantra ‘listen to the voice of the customer’ is described as flawed because of the customers’ limited ability to guide the development of new products. It identifies that this flaw is founded on the limitations of customers’ as grounded in the present experience and their ability

to imagine and describe possible innovations is a direct response to existing paradigms

How does Empathic Design identify needs that customers themselves may not understand?

How does Empathic design engender designers to develop ways to meet those needs, when, if even in the course of extensive research and design practise, customers never mention their desires?

Empathic Design, is proposed by Leonard and Rayport, as a series of techniques that can help uncover those customer needs that are unarticulated by the customers themselves'. At the foundation of empathic design is observation – watching people use products and services. However, unlike conventional research methods, such observation is conducted in its true context, the users own environment. In short, this is described as naturalistic observation. This allows access to a host of information that is not accessible through controlled observation-oriented research methods. This differs from ethnographic research in that it is conducted by multidisciplinary teams with a design bias and cues are driven towards design responses.

Leonard and Rayport extend this notion by suggesting that customers are in fact so restricted by existing paradigms that they cannot articulate their underlying needs. Customers cannot therefore suggest solutions that represent 'Distinctive, or 'Breakthrough' innovations – even if they have real needs that could be addressed. Empathic Design is constructed on the premise that customers are unaware of what they really want or need specifically because of a natural acceptance of current paradigms.

Market research is regarded by empathic design practitioners at IDEO as unhelpful when new technology is not tied to a familiar consumer paradigm. 'If no current product exists that embodies at least the most primitive form of a new product, consumers have no foundation on which to formulate their opinions.' (Leonard and Rayport, 1997)

Market research has to deal with the respondents' tendency to try to please the inquirer by providing expected answers, as well as their inclination to avoid embarrassment by not revealing practices they suspect might be deemed inappropriate. The Sharing of emotional thoughts and feelings are not easily accessible through traditional market research techniques. (Gordon & Pike, 1997). One must be aware of the bias that is inevitably introduced by the components of the research process. Why then, should observation be a better approach? (See Appendix D for further detail)

Observation highlights a range of interactions and how products lie within social contexts. (Black, A. 1998) IDEO continue to highlight naturalistic observation as a method for getting the best input from users to designers, specifically when considering the complex dimensions that contribute to users' experience of products.

Definitions and descriptions of Empathic Design

What exactly is it? How is it characterised? Empathic Design is characterised as a series of techniques designed to connect designers with the people who will eventually use the products and services they design. Segal and Suri (1998). It uses naturalistic observation as a foundation for identifying the unarticulated needs of customers in order to spark innovation. This is driven by the observation of current or possible customers encountering problems with products or services that they don't know can be addressed and may not even recognise as problems.

Leonard and Rayport go on to suggest that insightful product ideas come from a designer who combines knowledge of unexpressed needs with knowledge of how to fill those needs.

The oft-repeated advice to 'delight the customer' assumes real meaning when product or services push customers anticipations and deliver the unexpected. The crux of the problem lies in that, those who know what can be done do not come into direct contact with those who need something done. Thus, empathic design techniques are proposed to make this connection.

" When we explore the customers' worlds through the eyes of a fresh observer while simultaneously carrying the knowledge of what is possible we can send capabilities in new directions." Leonard and Rayport (1997). Consider it a process of mining knowledge assets for new veins of innovation. Usually underlying technologies and methodologies exist; they just need to be applied differently.

It is not suggested however, that Empathic-design techniques replace market research; rather, they contribute to the flow of ideas.

### 2.9.2 Empathic Design Cues

Empathic Design techniques are designed to uncover key insights with regard to the latent and tacit needs of customers through observed flaws in existing product interactions and experiences and are guided by specific cues:

**Triggers of use.** *What circumstances prompt people to use a product or service? Do customers turn to a product in when, and in a way that is expected? It is unanticipated usage patterns that can identify opportunities for innovation, through product design and availability of new markets.*

**Interactions with the user's environment.** *How does a product or service fit into a user's own idiosyncratic systems, whatever they may be?.*

**User Customisation.** *Do users reinvent or redesign a product to serve their own purposes? Sometimes users combine several existing products to solve a problem, not only revealing new uses for products, but also highlighting their shortcomings.*

**Intangible attributes of the product.** *What kinds of peripheral or intangible attributes does a product or service have?*

These cues are primarily aimed towards uncovering opportunities for innovation. These opportunities, however remain driven by the flaws in existing product-specific interactions and contexts. They do however express a direction towards investigating wider user activities.

### 2.9.3 Empathic Design: the Process

Engaging in empathic design, or similar techniques, such as contextual inquiry can be achieved in a variety of ways. However, most articulate documented approach is a 5 step process employed by IDEO. (Leonard & Rayport, 1997). It should be noted that the researcher has identified similar techniques adopted by industrial designers in a consultancy environment. PDD (Pankhurst Design Development) use techniques that facilitate the 'immersion' of cross-functional design teams in customer problems. These techniques are not published and are less precisely articulated.

#### 2.9.3.1 IDEO '5' Step Process

*Step 1: Observation. It is important to clarify who should be observed, who should do the observing, and what the observer should be watching.*

*Because a critical objective of such observations is to match the unarticulated needs of users with technological possibilities, , the qualities associated with an empathic design team should include open-mindedness, observational skills, and curiosity.*

*The people being observed should be participating in normal routines – playing, eating, relaxing or working at home or the office. It is also suggested that observations should be as naturalistic as possible.*

### *Step 2: Capturing Data.*

*Because empathic design techniques stress observation over inquiry, relatively few data are gathered through responses to questions. When they wish to know how to interpret peoples' actions, observers may ask a few very open-minded questions. These Questions are used to act as prompts for observation:*

*Most data are gathered from visual, auditory and sensory cues. Empathic design teams often use photography and videography as tools.*

*Video is used specifically to capture subtle, fleeting body language that may convey large amounts of information and store it for future review and analysis. Involuntary and unexpected cues can come and go within a span of mere seconds and are hard to capture in notes.*

*Even still photographs that can be lost in verbal descriptions. Photographs or drawings (which artists and designers can produce on the spot) show spatial arrangements and contain details that may have gone unnoticed while the team was on location.*

### *Step 3: Reflection and Analysis*

*Following the gathering of data in varied forms, the team reflect on what they have observed and review their visual data with their colleagues. Those individuals – uninhibited by possibly extraneous information, such as the reputations of the individuals or companies visited or the weather at the observation site – will focus on the data before them, and they too will see different things. They may ask questions or raise issues that the team members may not be able to respond to – this will lead to further observation. At this point the team tries to identify all of its customers' possible problems and needs.*

### *Step 4: Brainstorming for solutions.*

*Brainstorming is a valuable part of any innovation process; within the empathic design process, it is used specifically to transform the observations into graphic, visual representations of possible solutions. Design firms maintain that this step is often undervalued.*

*Although brainstorming is usually associated with a creative process, it is not undisciplined. IDEO heed 5 rules:*

*Defer judgement*

*Build on the ideas of others*

*Hold one conversation at a time*

*Stay focused on the topic*

*Encourage wild ideas*

*Such sessions are valuable, not only for the ideas that are generated during the actual brainstorming session but also for the concepts and solutions that occur to people later, because the seeds to them have been planted in their minds.*

Brainstorming sessions held as part on the empathic design process needs supporting infrastructure. Though, IDEO recognise the connection between the capture and analysis of customer data and brainstorming activities, And identify an need for a supporting infrastructure, there is no explicit methodology for connecting these two activities.

### *Step 5: Developing prototypes of possible solutions*

*Prototypes are not unique to empathic design. However the more radical the innovation, the harder it is to understand how it should respond as a designed object. Just as researchers gather useful visual data, so too can they stimulate communication by creating some physical representation of a new concept for a product or service. Prototypes are a critical part of the empathic-design process for at least 3 reasons:*

*Prototypes clarify the concept of the new product or service for the development team.*

*They enable the team to place its concept in front of other individuals who work in functions not formally represented on the team.*

*They can stimulate reaction and foster discussion with potential customers of the innovation because of their concreteness.*

*Sometimes, two prototypes are used; one that emulates the function but not the form, and another that illustrates the ideal physical appearance of the intended product, though it is not functional. Simulations are also useful prototypes – not only of environments but people as well. Role-play situations can have an important function in the design process. This kind of empathy can allow the design team to channel the possibilities and their intensive knowledge so that they fall within constraints that could not otherwise personally experience.*

*(IDEO, Palo Alto 1997) – also cited in Leonard and Rayport (1997)*



### 2.9.5 Summary of Principles and characteristics of Empathic Design:

Tools and techniques used in the implementation of an Empathic Design approach are intended to uncover opportunities for innovation through connecting designers with the latent and tacit needs of customers. An approach of naturalistic observation that can be guided beyond product interactions and into the realms of customer activities and scenarios has the potential to present designers with stimuli and inspiration for the development of distinctive and breakthrough products. However, the informality of the inductive nature of this process relies upon the intuitive ability of "great designers" and multi-disciplinary teams. (Burns, C. IDEO 1998) as there is no explicit process guiding and supporting an industrial designers idea generation process. It is recognised that the impact of Empathic Design is dependent upon its involvement early in product development strategies. It responds to an industrial need articulated in the CUPID project EPSRC proposal and by industry, for designers to be involved earlier in the product development process.

### 2.10 Defining Design

This section will introduce the relevant history, concepts, influences and approaches that shape the context of this enquiry. Design literature is far broader than that of Empathic Design or even user-centred design since it has had far longer to develop. However, this is not to say that there is consensus with regard to design terminology or typology. (Thackara, 1997).

It should be noted that this breadth of the term 'Design' applies across a number of disciplinary boundaries: from arts and crafts based disciplines; including textiles and ceramic; to electronic interface design, or from mass production high technology products to small run furniture. Even if we consider more specifically, the products of design, these are widely varied and the process of design contributes across and between disciplinary boundaries, subject matters, scales of production and outcomes. This makes design as a term difficult to 'nail down'. For the purposes of this enquiry, the term 'Design' itself can be viewed as: art; problem solving; process (Cooper and Press, 1994).

Design has to develop a unique and universally accepted epistemology. As such, a coherent design community has yet to establish (Dilnot 1998). At the time of this study, no such consensus has emerged, and between practitioners adopting similar

stances across industrial design and automotive design sectors, differences remain. It should be noted therefore that the research has had to clarify and redefine what is meant by design for the benefit of participants in, and readers of this study. When we consider Empathic Design practice in relation to industrial design practice the following qualification will be observed:

“Design is the process of seeking to optimise consumer satisfaction and company profitability through the creative use of major design elements (performance, quality, durability, appearance and cost) in connection with products, environments, information and corporate identity. (Kotler, P., Rath, G.A., 1984) Design: A powerful but neglected strategic tool, *Journal of Business Strategy*, 5(2)”.

The most significant design dichotomy in relation to this enquiry is highlighted by (Dilnot 1998), who suggests that design is unlike other disciplines in that it can be, and is viewed fundamentally as either (or both) a process or agency, and can also be regarded by either artefact or outcome, thus consigning it to confusion and ambiguity.

This enquiry will highlight evidence of this dichotomy amongst practitioners and participants, and its affect upon design innovation and communication processes.

### 2.11 The Domains of Design

The broader perspective of design accommodates notions of shaping or influencing the future, and views design as a way of thinking or looking at the world. (Fry, 1999), highlights design as the primary agent for determining and shaping possible futures. Design practise, is not often described in this way, and is referred to as a complex series of disciplines or domains which operate within ‘design’. (Cooper and Press, 1994) refer to these domains as product design; environmental design (spaces); information design etc. Within these disciplines, specific design practitioners operate. For example, within Product design, industrial, engineering and production designers all operate.

### 2.12 Design Methodology

Design Research (methodology) that aims to understand the ‘nature of designing’ has been articulated by practitioners as important. However, describing what is an inherently unique and often independent activity is difficult to formalise, when considering its application across diverse sub-disciplines. A comprehensive review

of design philosophies, models, methods and systems that indicates the complexity of design and the ways it is conducted and studied is given by Evbuomwan, Sivaloganathan and Jebb (1996). This presents a summary of a number of design models and present design as: An **opportunistic process**; an incremental activity that involves an **evolutionary process** where changes are proposed to the current design to make them 'better'; an **exploratory activity**; an **investigative activity** that enquires of clients needs and available techniques, previously similar designs and past solutions: a decision-making process. These characterisations of the 'nature of design' will contribute to the focus of this research study and assist in the researchers design of subsequent methods to harmonise with the culture of industrial design.

### 2.13 The Design and Product Development Process

This study will consider 'integrated product development' and 'new product development' processes. It will also place the practice of Empathic Design within the stages of new product development. As discussed earlier in this chapter, 'design' is viewed and interpreted in many ways, the process of designing and developing a product is similar across design boundaries. This 'product development process (PDP) has the aim of designing, developing and launching an product to market. Design and product development processes of have a number of similar characteristics according to (Cross 1992). These normally consist of three or four sequential stages that describe the conception of a product, through its design, production and launch. It is clear from design literature that most models of design and product development that these stages are viewed and regarded consistently. This section highlights one model, not as a definitive design methodology, but to highlight a number of generic stages appropriate to most product development projects. Specifically this model will be used to highlight specific design stages.

This model, (Roy, 1996), defines four critical stages of the design and development process: (Also cited in Sherwin 2000, and Lofthouse, 2001)

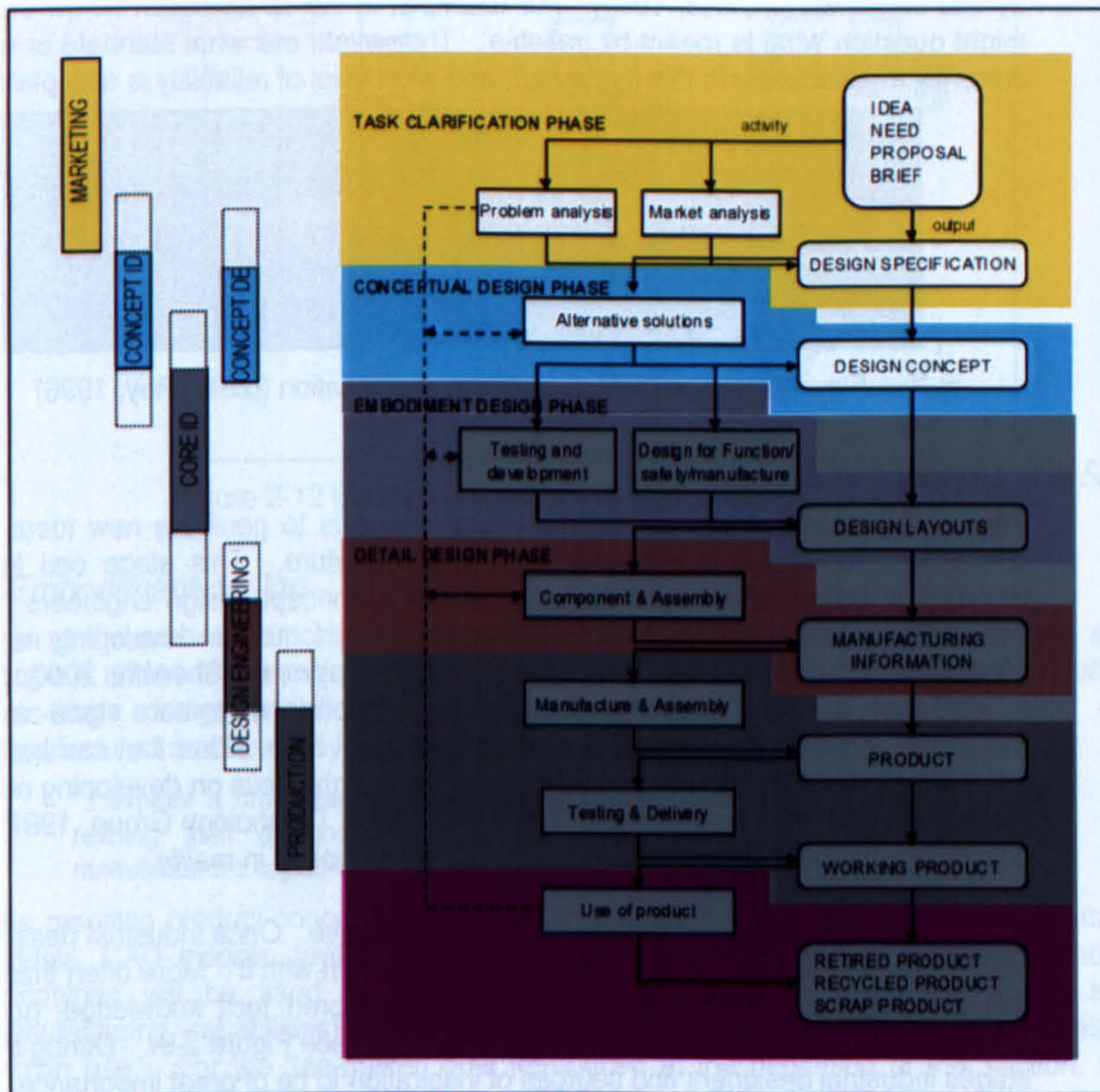


Figure 2.13 - An adaptation of Roy's (1996) diagram of the four stages of product design and development process

**Task Clarification:** Pre design brief. Identifies the needs of the project. A brief defines the parameters of the project and provides a set of objectives (often written) within which to operate. This forms the initial 'design space' for the project. This brief is transferred into a set of specific requirements as a product or project specification. It is important to note that the brief is named so, because it is often a 'brief' statement of design intent. (Cross, 1994). Designers are rarely involved in the formulation of a design brief, more are afforded levels of freedom within it.

**Conceptual Design:** project specification and requirements are translated into a series of concepts that challenge or complement business strategies (Sherwin, 2000, Tovey, 1997). This process often consists of sketches, models and test rigs together with other approaches to conceiving alternative solutions to fulfil a brief. This stage in the design process affords the greatest level of freedom and fewest constraints: The widest 'design space'. This is often a rapid and highly interactive process. It is important to recognise that solutions are often drawn from stored 'tacit' knowledge gained from previous design projects and design education (personal experience). During these early stages, industrial designers find

familiar sources of inspiration to be of great importance, (Lofthouse, 2001).

"Both in defining the context for new designs and in informing the creation of individual designs." (p.523) (Eckert and Stacey, 2000. cited in Lofthouse 2001). The result of this process is often communicable concepts in answer to the project requirements. They are often represented visually as renderings or models, but almost always as conceptual artefacts or objects.

**Embodiment Design:** transfers concepts into detailed visual representations, usually layouts and mock-up or prototype products.

During this process, designers:

"Explore a broad range of alternatives through drawings and models, steadily refining their designs as they test them against the users' needs and manufacturer's capabilities." (Wasserman, 1999). These representations often form the basis for testing and decision-making.

**Detailed Design:** Transfers the considered 'object' or product into a design that can be manufactured. Considers materials and assembly together with manufacturing process, tolerances, component detail and assembly etc. In essence, this is a 'design to manufacture' process. The information generated here is used to 'design' for production stages of product development.

It is widely accepted that the early stages of product development (Task Clarification), are critical to successful design and development. This is critical both in terms of informants to the design process and decisions made. It is at this stage where the greatest design influence is found. Designers tend to be involved in all of the above stages of the design and development process. This research study will focus predominantly in the first two stages of this 'generic' industrial design process.

### 2.14 Industrial Design's Use of information

Information that designers select when assimilating and synthesising data is often in the primary service of ideas – ideation process in the earliest stages of product development (pre-concept).

Traditionally, market research data is presented in report forms (See NOP interview 1999). This includes summarised and interpreted customer data. This type of presentation is directly opposed to the intuitive and often 'aimless' processes adopted by

industrial designers. Dewberry, E (1996) identified that designers highlighted an overwhelming need for new information at the earliest stages of the design process in relation to ecodesign.

Industrial designers involved in the earliest stages of product development (pre-concept) are often regarded as quite different from much of the product development process (post-concept) when considering learning styles and the assimilation of information. This is best explained by highlighting the distinct differences between industrial designers learning styles and that associated with the remainder of the product development team. Much of a development process requires:

“Relatively stable ways in which individuals prefer to receive and assimilate new information in a learning context.” (Durling et al., 1996)

However,

“...The style of teaching in design matches the learning preferences of art-based design students, and that designers’ learning preferences differ significantly from some other professionals such as engineers and business managers.”

The implication is that tools that are designed for much of the product development process are not necessarily appropriate to industrial design practitioners, particularly when considering the earliest (pre-concept) stages of product development.

Industrial designers use a wide range of resources to inform their design process. Industrial Design literature recognises that information is an important element of design projects. ((Baxter, 1995; Cooper and Press, 1995; Snoeck and Hekkert, 1998) Cited in Lofthouse 2001)). Not only is information important for stimulating new ideas for products, but also for gaining commentary on new ideas (Pedgley, 1999).

Consider the diversity of skills adopted by industrial designers. The diversity of knowledge that they draw upon is significant, particularly as industrial designers often cover a broad range of proficiencies.

During the earliest stages of the design development process, industrial designers refer to visually rich printed and electronic resources. Regularly referred to general design material such as ‘design week or ‘marketing review’ or ‘wallpaper’ are used to inform

their design. It is usual for design teams to have access to this type of material along with other paper-based resources which may be product or manufacturing process specific. (Pedgley, 1999).

Pedgley, (1999) identified a number of significant findings regarding the ways in which Industrial Designers' use information during product development. Significant issues have been related back to the defined stages of product development.

- Information was most concentrated during the embodiment stages (when manufacturing issues were considered in depth) and least concentrated during detailed design stages (during testing and refinement).
- A significant proportion of time during the design project was spent referring to information sources, demonstrating that the authors design process was not dominated by the use of prior experience during the embodiment stage.
- Most information can be regarded as 'actively sought' by designers on a 'need to know' basis rather than accidentally uncovered or offered without prompt or question.
- Designers use different resources at different stages of the product development process.

It is important to note that the author is concerned with the earliest stages of the design process, and whilst this literature refers to a designers propensity not to rely on prior experience when considering manufacturing information it can not be stated that this is the case when considering processes conducted at the earliest stages of new product development. However during the ideation process in task identification, "designers often rely on stored 'tacit' knowledge drawn almost entirely from prior experience." (Lofthouse 2001).

Designers are quite unique in their management of new information. As designers are charged with bringing together what is possible with what people want, information and the 'cutting edge' changes rapidly. Remembering that designers are 'generalists', they integrate specialist knowledge rather than acquire it. The mere existence of a new manufacturing technique represents insufficient data, but the designer doesn't need to understand the intricacies of such a process in order to benefit from it. The designer is required to develop an overview. Specific knowledge is available 'on demand' through subject experts. Harris (1999) also

cited in Lofthouse 2001), who notes that industrial designers are not necessarily limited by their knowledge,

“...and are not phased by the task of considering different technologies, possibly because they are not hampered by what they know”.

### 2.17 Defining Industrial Design

Designers as generalists and perceptive researchers:

Industrial Design can be regarded as a relatively new discipline within a broader design field, whose development can be linked to the demand for products specifically designed for mass production. One of the most useful and current descriptions of industrial design as used is by The Industrial Design Society of America who describe it as:

“... The professional service of creating and developing concepts and specifications that optimise the function, value and appearance of products and systems for the mutual benefit of both user and manufacturer.

Industrial designers develop these concepts and specifications through the collection, analysis and synthesis of data guided by the special requirements of the client or manufacturer. They are trained to prepare clear and concise recommendations through drawings, models (artefacts) and verbal descriptions.” (IDSA, 2000).

The practise of design as employed by industrial designers can be regarded as unique when considering a number of design processes and activities: Industrial designers are responsible for idea generation and embody principles visually through sketches, drawings and models. (Sherwin, 2000). Industrial designers often work in multi-disciplinary teams; they are specifically tasked within these teams, with the embodiment and communication of the design requirements of the team within the product concept(s). Industrial design is often referred to as the ‘user-centred’ design discipline since it is often required to consider factors such as user needs and requirements and product use and interaction. This user-centred stance as described by IDEO (1998), Presence (1999) and Leonard and Rayport (1997) does not acknowledge some key limitations: designers are often product specific in their approach to user-object interactions. Their perceived role within multi-disciplinary teams and the intellectual worth they bring often rests with an objectivised embodiment. That is an artefact-based concept.



### 2.17.1 The Role of Industrial Design Defined

Can industrial design be promoted as a strategic resource? A number of authors including (Svengren, 1997; Manzini 1998; Domus 1998) suggest that this should be the case. During the progression of this research, leading practitioners within the automotive sector have in fact developed 'advanced product teams' charged with integrating industrial design, specifically ideation within product strategy (Ford 2002).

Designers are often misunderstood as 'stylists' since they are often trained in visual language (product semantics) and so develop a strong visual vocabulary and visual principles.

Difficulties with the identity of industrial design often stem from the roles played within the 'domain' of product design. In many situations, industrial designers and design engineers share responsibility for the design and development of a product. However, the role, remit and design practises of industrial designers are quite different from that of design engineers. Several distinctions can be made between the two disciplines in terms of the competencies they bring to the design process. One key contrast as highlighted by (Bates and Pledgley, 1998, and Ulrich and Eppinger, 1995) is that Industrial Design is "commonly seen as 'people centred' and engineering design is commonly seen as 'technology centred'. This is highlighted further when expertise is considered: Engineers are more likely to be experts in specific aspects of design, such as ergonomics, electronics, or mechanics, whereas in contrast, Industrial Designers are 'generalists' that are familiar or proficient in a wide variety of specialist areas. They may have considerable knowledge in similar areas, but are required to broach a much broader spectrum of design aspects.

- (Tovey, 1997) proposes the design tasks of industrial designers (in the automotive industry) as follows:
- To represent the market and user requirement in determining the ergonomic (objective) and appearance (subjective) of the product

To integrate, market, user and engineering requirements into a whole design solution. This holistic view of the product concept sets two further requirements of the Industrial Designer:

- To visualise the product concept (communication)
- To represent alternate design solutions (idea generation).

Tovey further simplifies the distinction between the roles of industrial design and design engineering in stating:

“the sequence of activities in which the (industrial designers) are given responsibility for the early stages of the design program and then hand over to engineers gives further emphasis to the differences between their methods of cooperation. Responsibility for the initial conceptual design in the creation of the new product rests with the (designer), and they may take it to a fairly detailed stage with fully defined surfaces before engineering design assumes control. Much of the purpose of the engineering therefore is to make practical sense of the (industrial designers) proposals. This involves analytical thinking in order to optimise the design and sometimes, considerable ingenuity. It is not however, to any significant degree, creative.” (P.10)

it is perhaps more meaningful to regard the placement of industrial design as a continuum. It is in fact training and specific professional contexts that determine an industrial designers position on this continuum.

Key distinctions between these two disciplines can be succinctly explained by considering the ways in these two disciplines approach design thinking:

“Thinking is usually categorised in two ways. On the one hand it is reasoning, rational, or convergent thinking, and on the other is imaginative, intuitive or divergent thinking. The former is logical, purposeful and concerned with outward directed problem solving, while the latter is unstructured, at times aimless and more inwardly directed.” ((P.22) (Lawson 1990), Cited in (Cooper and Press, 1995 and Lofthouse 2001)).

An industrial designer does not adhere to either one of these modes of thinking exclusively, more controls and combines these modes at different stages in the design process. The latter tends to be front-loaded in (pre-concept (task identification) and concept stages), and the former in the latter stages of the industrial designers process (embodiment and detail): ((Lawson 1990) also cited in (Cooper and press, 1995) and (Lofthouse 2001)).

In the automotive cases investigated in this enquiry, the role of industrial designers' as described above is adopted by design engineers and there is no integration of industrial designers beyond

external 'styling'. In this instance the idea generation 'ideation' process tends to be technology centred rather than people centred.

Ideation however, is becoming a feature of the automotive and industrial design processes, as it becomes more widely recognised that the divergent thinking associated with the often regarded 'haphazard' early stages of an industrial design process is becoming increasingly valuable, and can play a strategic role in product development. Joyce et al. (1998) highlights the thinking of an industrial designer during the earliest stages of a design process to be predominantly divergent:

'divergent thinking is characterised by ideation and fluency with unusually associated ideas.. any one of these ideas may be acceptable'. (Durling et al., 1996)

Conversely the process adopted during the latter stages of design development is often associated with design engineers is often regarded as convergent thinking (joyce et al., 1998 Cited in Lofthouse 2001).

'convergent thinking progresses towards the production of a single, right answer to a problem... characterised by a logical, analytical approach to problem-solving' (Durling et al., 1996).

Different stages of the design process and so different topics within the discipline of industrial design require different approaches and design thinking when problem-solving.

Industrial designers are often referred to as 'generalists'. This is not a disparaging classification of designers, more a recognition of a perceptive discipline charged with integrating a wide variety of subject matter and informants to a complex process of product development. This broad range of proficiencies is best described by Bates and Pedgley's Cone of industrial design. Within it are significant aspects of an industrial designer's potential repertoire.

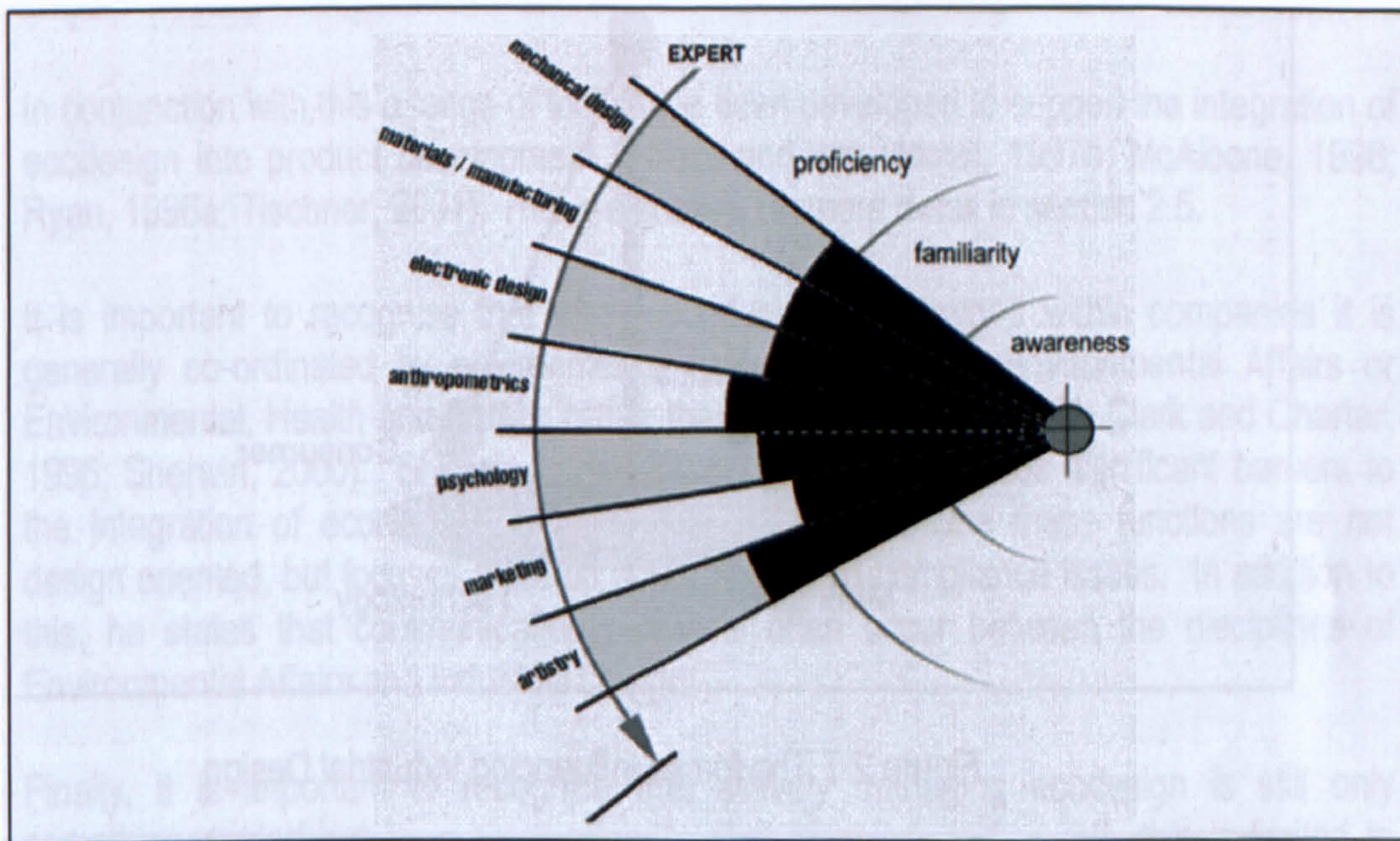


Figure 2.17 – The cone of Industrial Design (Bates and Pedgley, 1998)

This is reflected in the diversity of education within the bounds of the industrial design discipline. Cooper and Press' (1995) model of education illustrates the knowledge areas that industrial designers are introduced to during industrial education.

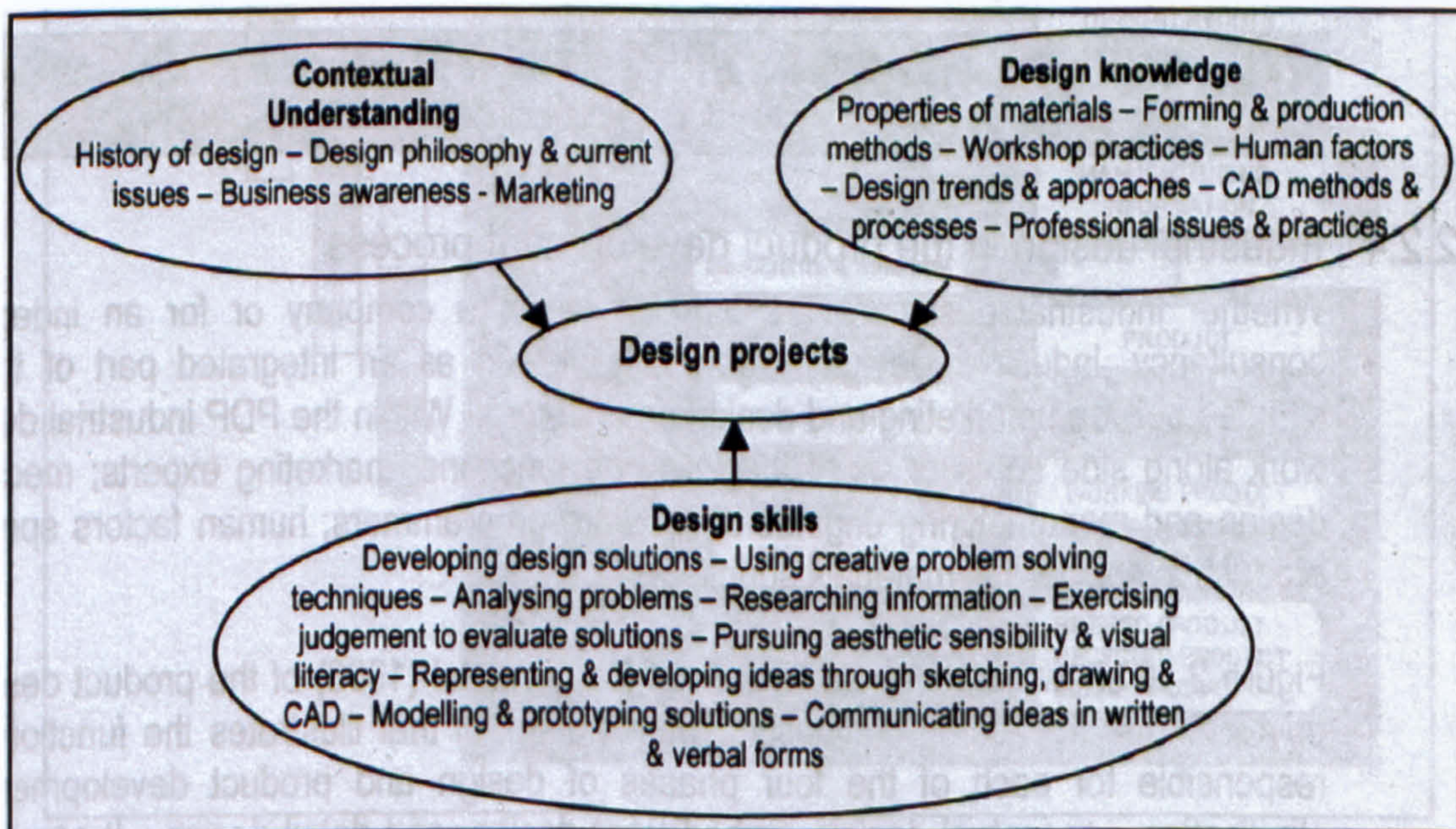


Figure 2.17b – The Different Elements of Design Education (Cooper & Press 1994)

The function of an industrial designer within industry:

Industrial designers as practitioners tend to work within one of two contexts. These are 'in-house', as a function of an organisation. Typically these are specialist industrial design teams, specific to a product sector. These design teams tend to house specialist knowledge of their organisations' abilities and capacities together with more in-depth knowledge of a product specific nature. For example: Sony, Philips, Electrolux, Morphy Richards) Designers may also work s part of a 'design consultancy'. Typically these are less specialist in terms of product sectors, but serve clients through breadth of understanding and a fresh approach to a design problem Theses design teams tend to be fore flexible in their approach to design practise and are often small, 'fluid', multi-disciplinary design teams. For example: (IDEO, PDD, Alloy, DCA). Again this is a simplistic representation of complex environments. If we regard these two functions as at opposing ends of a continuum, there are industrial design teams that operate along this continuum.

### 2.18 Ideation: Idea Generation

Idea generation tools and creativity techniques are often adopted by leading practitioners such as IDEO, generally in conjunction with controlled brainstorming and usually in workshop environments. These provide a controlled and non-critical environment in which ideas can be generated. But how do customers inform this process? This enquiry will focus on facilitating customer driven ideation and the removal of designer-led constraints or barriers. This research recognises that further investigation is required to develop a more detailed understanding of the types of information needed by Industrial Designers involved in 'understanding customers'. (Lofthouse, 2001) highlights that current idea generation tools are compatible with industrial design processes and do in fact promote creativity, but the way these tools are presented is not suited to the culture of industrial design, as they are often regarded as time consuming 'away from the studio'.

### 2.19 Matching tools to culture:

Sherwin and Bhamra state that:

...What are needed are "...tools methods and techniques to 'shape and steer', rather than simply to 'validate' ... Designers clearly need information sources to generate concepts and ideas rather than to give credence to existing design decisions".

This is matched by a lack of understanding regarding how information should be presented to industrial designers.

“Companies who provide information for use in Industrial Design (e.g., printed texts, software, internet publications) need to (a) present the right kind of information, and (b) deliver information in a manner that industrial designers can make ready use of in their work.” (P.18-19) (Pedgley, 1999)

This supported by both Bakker (1995) and Sherwin (2000) who identify that information presented to Industrial Designers’ needs to be presented visually.

It is important to note that the culture of Industrial Design does not generally support or embrace the use of structured tools, with the exception of CAD and related software. Where the ‘hands-on’ training and supervision is employed as a tool. As such, current tools for communicating customer data do not take into consideration the mismatch of the learning culture of Industrial Design.

### 2.20 Conclusions Drawn from the Literature Review

Kano’s model of customer satisfaction suggests that functional innovations and unexpected ‘features’ are the most likely pathway to delight. Remember that this is within the time frame of the Kano model and doesn’t take into account longevity derived from product or customer experiences. Burns (2003) suggests that delight can be achieved through delivering basic qualities to an exceptional standard. Delighter clinic highlights intangible qualities of products as avenues to delight and ‘feel cosseted’ – ‘feels well built’.

The Kano model as it stands highlights expected (basic), linear and unexpected (usually characterised as functional innovations). It suggests that these unexpected features are the most likely cause of delight in customers, in respect of the level of achievement required through in this case product design.

The Empathic Design methodology in its current guise, since it is specifically designed to uncover the latent and tacit ‘real needs’ of customers with regard to product use and interaction, can uncover opportunities for high impact functional innovations. However, Empathic design as employed by leading practitioners and proposed by Leonard and Rayport (1997) remains fundamentally, product centred and capable of delivering distinctive innovations. The processes of customer understanding and ideation remain disconnected and rely on the intuitive abilities of industrial designers.

### 2.22 Research Objectives and Justification

The central objective is to investigate the development of an inductive methodology for industrial designers to conduct innovative ideation through increased understanding of end user experiences, data organisation and communication methods.

This research seeks to investigate and develop the Empathic Design model in relation to the continued development of the Kano model of customer satisfaction. There is evidence to suggest that longevity of satisfaction can be achieved through the exceptional delivery of basic functions – that is the ‘real needs’ of customers are understood, designed and communicated. Empathic design and the Kano model use products as the starting point of design activity. The author will seek to develop Empathic Design as a methodology to shift the starting point of design research – and ideation to customer activities and experiences. This methodology will seek to address a number of industrial design context specific considerations with regard to working practise. Despite an Empathic Design approach’s ability to integrate with industrial designers natural research process, and maintain richness of data that is communicable across design teams, it remains product-user centred. A higher level of impact upon customers could be achieved if we remove product constraints. In essence, this research seeks to develop these models into interventions into practises of living. That is ‘real life’ customer experiences. The Kano model of customer satisfaction (1995) will shift from functional innovation or feature driven to intangible experience driven customer satisfaction. This research will observe changes to the Kano model as it affects change within the industrial design process in an integrated product development design context.

Demonstrate customer integration into design space: the widening of initial space and the support and guidance required throughout the ideation and development process. How customers inform the early stages of new product development.

Designers need to communicate within multidisciplinary design teams and externally to decision makers. In this instance is artefact centred communication appropriate? Are there language discrepancies?

### 2.21 Summary and Critique of Literature

The literature reviewed in this chapter has identified that there are calls for organisations to delight customers. Whilst there is an industrial need there is no empirical evidence to suggest that this is currently achieved in new product development. The literature points to the relationship between customer expectations and delight and calls for those involved in product development process to exceed customer expectations. Kano (1995) identifies what, in product terms, can provide avenues to customer delight – delivering the unexpected. Whilst Kano identifies delight in product terms, this doesn't extend to experiences that fall outside product attributes. However it does highlight innovations as having the potential to achieve delight.

The literature further indicates three types of innovation that impact upon customer experiences: 'Incremental', 'distinctive' and 'breakthrough'. It is breakthrough innovations that are regarded as having the most significant impact on customer experiences. IDEO, at the forefront of innovation in product sectors, also identify opportunities for delight through engendering change in customer activities. IDEO also identify that it is the understanding of customer activities that is critical in conceiving innovations that create positive changes in customer behaviour. In short, if we fail to understand customer activities we risk creating 'disruptive' innovations. It is this drive for 'breakthrough' innovations coupled with a drive for understanding customers that has given rise to the proposal of Empathic design as an approach to sparking innovation. Empathic Design (Leonard and Rayport, 1997), identifies that understanding the latent and tacit needs of customers can spark innovation by exceeding expectations. Empathic Design actively seeks to bring together customers and designers through direct observation and interaction. It is this empathy that can uncover opportunities for innovation.

This literature further contextualises industrial design as a discipline with distinct learning styles, information requirements and characteristics for creative thinking. It further highlights opportunities to extend the role of industrial design as a strategic resource and as a resource for developing strategies for innovation. It calls for industrial designers to be involved earlier in product development processes and responds to the new questions asked of industrial designers. That is designers are now asked to understand customers.



Visualisation of literature and research focus:

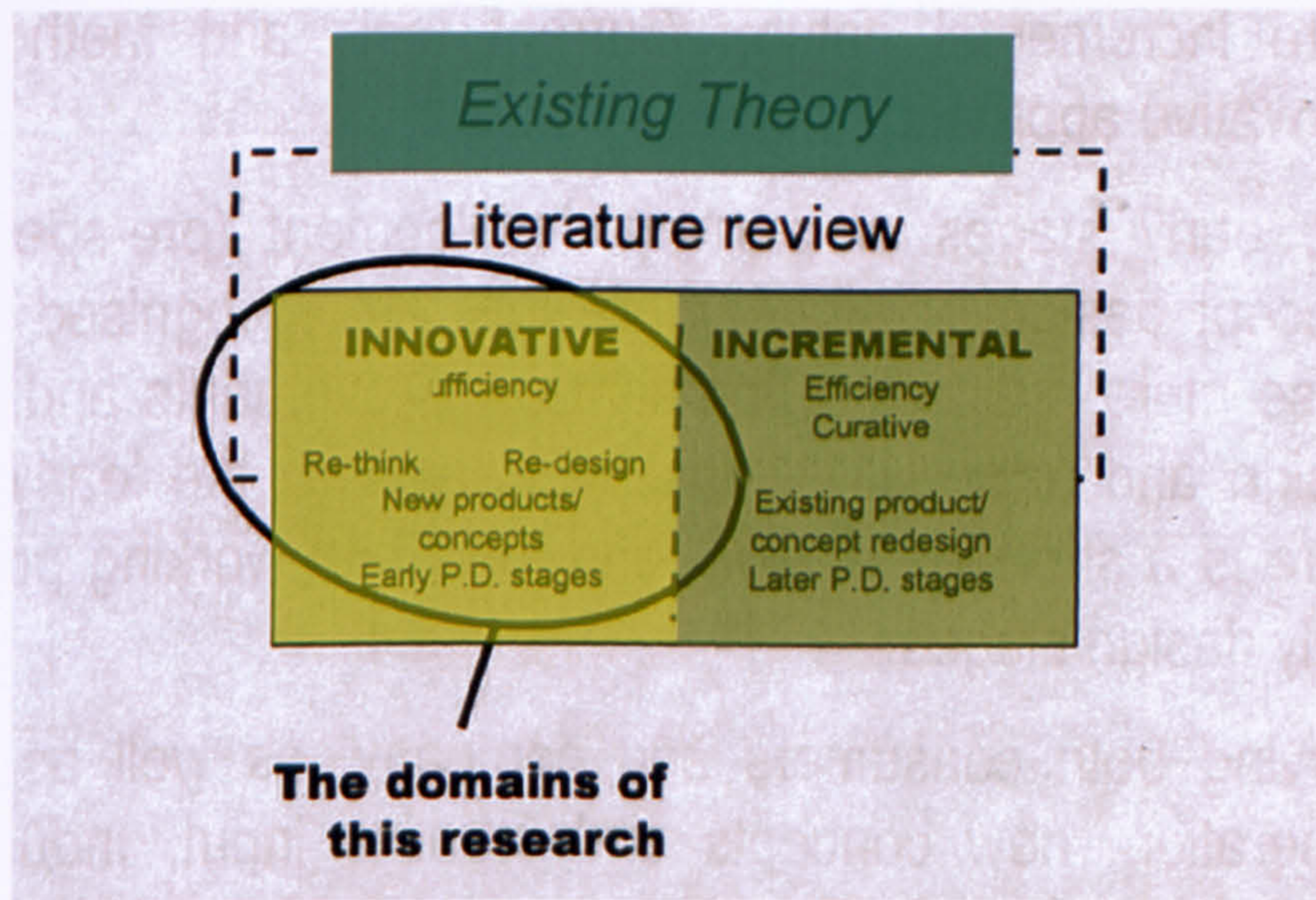


Figure 2.22 – Visualisation of the literature research focus

This presents a visual representation of the domains of this research. It clearly states an innovative approach to customer focused industrial design. It further highlights the emphasis of research on the earliest stages of new product development and the search for new design responses. These will be explored using previously stated research questions:

- How does an 'Advanced Product Design' team (involved in the earliest stages of new product development; pre-concept), integrate customer understanding into their design process?
- How do industrial designers conduct customer-focused design?
- How do designers participate in 'customer understanding' processes?
- What are the characteristics of the earliest stages of customer-centred industrial design?
- How do industrial designers communicate customer understanding across design teams?

For the purposes of this enquiry 'innovative' approaches to customer-focused ideation within an industrial design context will be studied largely through: the early stages of the product design and development process, an industrial design environment as well as industrial design practice.



### 3.1 What is Research?

In this context, and certainly in relation to a Ph.D: systematic enquiry, research methodology, which is applied to a new topic, where or in ways that constitutes originality. Methodology, 'the science of Finding out' (Robson, 1993), supports and frames research questions in order to support and meet research objectives. Before describing the research and methodological frameworks, the aims and objectives as well as key research questions will be summarised:

### 3.2 Research Aims and Objectives

This enquiry aims to contribute to the epistemology of Industrial Design its theory and practise. It is an empirical enquiry into the integration of customer requirements into early stages of the design and product development process and the characteristics of its practise.

#### 3.2.1 Aims

To explore and describe the integration of customer understanding into the earliest stages of the ideation and design processes.

#### 3.2.2 Objectives

- To critically review user-centred industrial design literature and summarise into 'leading edge' theory.
- To identify the characteristics of the integration of customer understanding into industrial design practise.
- To develop an understanding of the nature of industrial design driven customer understanding
- To explain how designers can conduct and develop Innovative Ideation that is customer driven idea generation through the development of an Empathic Design methodology.
- Comment upon the industrial approaches for achieving customer driven innovative ideation.

### 3.2.3 Research Questions

The key research questions are:

- How does, an 'Advanced Product Design' team, (involved in the earliest stages of new product development; pre-concept), integrate customer understanding into their design process?
- How do industrial designers conduct customer-focused design?
- How do designers participate in 'customer understanding' processes?
- What are the characteristics of the earliest stages of customer-centred industrial design?
- How do industrial designers communicate customer understanding across design audiences?

### 3.3 Research Paradigms

The research approach, strategy and selected methodologies are unlikely to adhere to either of the often, polarised philosophies of Positivism or Phenomenology (the new paradigm). More the methods that have been selected place the research of the author along a continuum that reveals an epistemological stance. The purpose of this chapter therefore is to outline the appropriateness of the stance taken by the author with regard to the objectives of the research, and the questions it seeks to address. In short it is not the epistemological stance that has dictated the research design, but the methods selected have revealed the stance of the author.

If we regard the polarised philosophies of Positivism and Phenomenology as at opposing ends of a continuum, their brief characterisations are as follows:

The positivist epistemology is closely linked to what is traditionally considered 'scientific' research, in that it uses deductive methods to test and validate theory. This research paradigm requires that the observer maintain their independence from the researched subject; the establishment of causality and the discovery of fundamental laws and regularities should be the primary goals of this 'scientific' enquiry. The positivist stance is that knowledge must be based upon observations of external reality aims to be value free; be hypothetico-deductive; reductionist; relies on generalisations to develop theory; and provides cross-sectional analysis, (Robson, 1993). Furthermore operationalisation of concepts allows 'facts' to be measured quantitatively. However, it is the exclusivity of this epistemology that leads the author towards phenomenological end of this continuum.

Conversely, the study of complex, 'real life' situations are more suited to a research paradigm designed to interpret subjective interactions. Since this research is concerned with specific interventions into industrial design practise, this research will be required to understand what happens and why in specific instances of design practise. 'Naturalistic enquiry' interpreted as a phenomenological approach is more holistic and has greater regard for smaller samples of more in depth understanding and is characterised by a focus on the meaning that research subjects attach to social phenomena (Saunders et al, 1997), rather than reductionist.

The primary research paradigm adopted in this study can most closely be regarded as 'naturalistic enquiry' and as such, has leanings towards phenomenological epistemology. A post-positivistic stance in an emergent topic, significantly, leans heavily towards existing theory as the starting point of this research rather than a phenomenon of interest (Olander, 1993). This is not as well suited to an emergent 'real life' research topic. What will become increasingly evident as the research strategy unfolds is that methods have been selected on the basis of their appropriateness to the situation being studied, and not on a qualitative or quantitative basis or with an epistemological bias. However, the very nature of this enquiry, particularly noting the emergent nature of this subject lends itself primarily to an exploratory research approach. (Henwood, 1996), supports this stance 'appropriateness of research methods should be determined by the situation being studied rather than by the epistemological standing of the researcher.' These research paradigms and ontological questions form the continuum that is likely to underpin both the research design and methodological framework.

### 3.3.1 Designing the Enquiry

Robson (1993) describes three traditional types of research strategy:

Design the research so that necessary insights can be gleaned, rich understanding of specific contexts can be gained, data is useful and can form the platform upon which theory can be built:

Case Study: Action research approach, yields deep understanding of specific contexts but is not necessarily generalised.

This research enquiry has been designed in three stages:

Stage 1: Exploratory study – case study research used to glean valuable insights into the earliest stages of new product development in one specific case: Nissan, and using students as a secondary case to better understand the innovation process within industrial design practise.

Data in this phase was collected using direct observation, interviews and specific workshops designed to understand specific aspects of industrial design practise and use of customer information. This also triangulates the data to provide additional commutability of initial findings. Data was analysed using a coding and clustering methodology, coding, opinions, observations and specific aspects of practise into themes.

### 3.3.2 Research Approach

Chapter two shows that designers' involvement in the briefing process is important but is a relatively new pursuit. The literature review further highlights customer understanding within industrial design has not yet been addressed in any detail in either literature or industry. The research approach therefore must be appropriate to uncovering rich insights as to the context of the enquiry, the research problem, and reflect the required contribution of the research to industrial design practise. In this instance multiple methods were adopted across understanding, analysing the research problem and developing a 'real' contribution to industrial design practise. In recognition of these shortcomings within the existing research knowledge, this research aimed to investigate the methods, tools and techniques industrial design teams required to support the integration of customer understanding into the earliest stages of new product development.

This research enquiry does not seek to support or contradict existing empirical or anecdotal evidence, but instead intends to build a theoretical understanding of the type of support required by industrial designers involved in the earliest stages of product development, to integrate customer understanding into new product development.

### 3.4 The Research Design

This section describes the selection of the research strategy and the development of the research design and methodology for this research study. This will describe the methodological and research development concurrently as these two streams are difficult to separate.

This study began with the following aims:

- To explore and the integration of 'customer understanding' processes in to the early stages ('ideation' and 'concept development') of an industrial design process.

The literature review highlighted gaps in both knowledge and practise. There were few examples of research into Industrial Design oriented customer understanding processes, or their practise during the processes of ideation and concept development, and little of an empirical or systematic nature. Those projects that do, tend to focus on design outcomes and design responses rather than industrial design processes and integration. In short projects tend to focus on the outcomes of innovative concepts driven by customers (IDEO, 1999), or the need to drive innovation through 'customer understanding', rather than how you do it, or what happens when you do. Moreover, how the two distinct aspects are integrated with industrial design practise. This lack of empirical work highlighted a need to focus on the practises and processes of designing, more specifically the processes of ideation and concept development.

3.4.1 Research Strategy

The aim of this research strategy is to provide a robust framework to support the research design and allow the development of a research structure that affords this study exploratory freedom. Robson (1993) states that it is satisfactory to consider three main strategies: Case studies, experiment and survey. (see table below).

Experiments:	<p>“Measuring the effect of manipulating one variable on another variable.                  Typical features: selection of samples of individuals from known populations; allocation of samples to different experimental conditions; introduction of planned change on one or more variables; measurement on small number of variables; control of other variables; usually involves hypotheses testing.”</p>
Survey:	<p>“Collection of information in standardised form from groups of people.                  Typical Features: selection of samples of individuals from known populations; collection of relatively small amount of data in standardised from each individual; usually employs questionnaire or structured interview.”</p>
Case Study:	<p>“Development of detailed, intensive knowledge about a single ‘case’, or of a small number of related ‘cases’.                  Typical Features: selection of a single case (or a small number of related cases) of a situation, individual or group of interest or concern; study of the case in it’s context; collection of information via a range of data collection techniques including observation, interview and documentary analysis.”</p>

Table 3-5 A Summary of the three traditional strategies outlined by Robson (1993).

3.4.1.1 Control over events

Research strategies are dependent upon the level of control a researcher has regarding the specific contexts and events to be investigated. In this instance a case study methodology would be most appropriate given the relatively low degree of control afforded to the author during the main study. However, during the pilot study, an experimental research strategy could be adopted. However, this strategy is not well suited to an emergent area or the uncovering of unexpected insights. In this instance, a combination of action research approach as multiple case studies will be adopted for both the pilot and main studies. This study is concerned with the views, opinions and practices of industrial designers, which inherently limits the ability of the researcher to exercise strict



control. The reasons for this are the proximity of the researcher to the studies taking place, and the control of external influences upon individual actions and processes. The participants are likely to display individual characteristics, which will need to be balanced with the control of the researcher. It is the aim of the researcher not to inhibit the individual practices of industrial designers.

This study is grounded in the contemporary practice of industrial design. Specifically, an industrial designers' use of customer focused information and its integration and communication during the earliest stages (pre-concept) of product development. The aim is to develop a supporting framework in order to affect the current paradigm of the industrial designer. This research focus once again highlights that an action research driven case study is an appropriate research strategy. In essence this investigation will affect as well as observe change in what is a complex situation. The researcher will play this role.

### 3.4.2 Case Study Methodology

During the case part of the pilot study, data were collected via a wide range of techniques, from a significant number of sources within the three case contexts. This was conducted in accordance with the canon of case study design (Yin, 1994).

### 3.4.3 Action Research Methodology

Action research deals specifically with change and intervention. Action research actively involves the researcher as an intervening practitioner affecting change through this intimate involvement. There are significant advantages for researchers adopting such an approach. In what is often regarded as an emergent research discipline, the intimacy afforded by Action Research has significant benefit in that "the role of the change agent (intervening practitioner) created substantial opportunities for access and that it might open up useful research opportunities" (Gummesson, 1991, p.47).

### 3.5 Research Structure

As highlighted in chapter 1, this research is divided into three phases:

- Phase 1: Best Practise Review
- Phase 2: Pilot Project
- Phase 3: Main Investigation

#### 3.5.1 Phase 1: Best Practise Review

Part of the exploratory study and designed to support the initial pilot study, this was an interview and observation based investigation to define best-practice amongst leading practitioners within the discipline of industrial design when considering:

- Customer understanding
- Integration of customer understanding into the earliest stages of new product development.

Data Collection within the best-practise review, covering focus, techniques and aims:

- Market Research Experts
- Industrial Design Consultants
- Industrial Design Education

Interviews and observations were selected as the primary techniques for this study for a number of reasons, including: access, and critically depth of understanding.

It is important to note that this aspect of the research study does not adopt a survey approach as there are so few practitioners specialising in customer understanding which restricts the sample size making a survey ineffective, and the primary objective is to understand the nuances of customer understanding as practised by industrial designers. In depth interviews and observations in this case were considered more appropriate.

Experts were selected on a representative basis, regarded by design literature and peer review as leading practitioners in their field. The sample was entirely based in the UK as a result of access and budget constraints. Companies were contacted in writing and by telephone and appointments arranged by the researcher.

### 3.5.2 Phase 2: Pilot Project

The ultimate aim of the pilot study was to generate an intimate understanding of the current situation regarding an industrial designers' use of customer oriented information in the earliest stages (pre-concept) of a new product development process. This was a necessary step in answering the stated research questions. It was clear that a single case, supported with multiple observations would provide the level of understanding required for this stage of the study.

The use of a single case during the pilot study, supported by multiple data sources provide a level of generalisability in what was inherently an exploratory study with a primary regard for the richness of data and yield of valuable often case specific insights, together with a detailed understanding of how customer understanding could be integrated into the earliest stages of new product development. This data also helped to:

- Generate a rich and elaborate background understanding of the issues involved in integrating customer understanding into Industrial Design Practise.
- Develop a richer picture of industrial designers' requirements of customer understanding tools
- Develop an understanding of how Empathic Design was perceived by industrial designers
- Facilitate learning from experts in the field of customer understanding in industrial design.
- Provide fresh stimuli for the study (Alan et al., 1999).

### 3.5.3 Phase 3: Main Investigation

The main purpose of this study was to obtain feedback from a range of industrial design participants in multiple cases for the prototype developments of Empathic Design Tools and Techniques with a view to sparking customer driven ideation. Using the findings generated from the literature, and research phases 1 (best practise review) and 2 (pilot study), Empathic Design methodologies would be developed and the hypotheses that emerged through the research, tested.

This stage of the research would adopt a case study approach, based in the research paradigm of 'naturalistic enquiry'. This continues to provide opportunities to maintain the richness of data collected in the earlier phases of the research. It also maintains the objectives in 'real life' situations and continues to provide access to

the nuances of the process being studied, the practise of industrial design. Using case studies or in this case 'action research' as a basis for research provides the opportunity for the researcher to select either single or multiple cases. These selections carry distinct advantages and disadvantages. On the one hand, single cases provide the opportunity to gather rich and deep insights into a company or organisation (Robson, 1993), but provide findings that are less easily generalised. On the other hand, multiple cases do not necessarily provide the same opportunities to investigate a situation, in such detail but,

"the evidence... is much more compelling, and overall study is therefore regarded as being more robust" (p.45) ((Herriott and Firestone, 1983) cited in (Yin, 1994 and Lofthouse, 2001))

In this investigation a natural single case study emerged in the form of a collaborating company, Ford together with the existing cases of Nissan's European Technical Centre, and the University of Hertfordshire's Department of Design. In order to maintain continuity a main single case study was retained, and key insights were explored and tested in one further case. It was felt by the researcher, that this would maintain balance and level on consistency by continuing to use the University of Hertfordshire product design students on 'live' industrial collaborative projects as used in phase 2 (exploratory pilot study). In order to gain professional generalisation, Ford's advanced product group were adopted as a second case and emerged, during the course of this enquiry, as ideation specialists within their organisation. It was anticipated that testing prototype methods in these cases would yield greater feedback opportunities that could be used to validate hypotheses generated during this study. It would also enable a deeper understanding of industrial designers' requirements in terms of customer driven ideation to be identified and improve the generalisability of the research findings (Robson, 1993).

### 3.5.4 Research Access and Selection of Companies

Although the pilot study highlighted appropriate cases for the main study, access constraints and issues surrounding the sensitivity of data limited the companies that could be used and the observations that could take place. In this instance cases were selected on the basis of their ability to provide access to the richness of data required, continuity of the research and generalisability of the research findings. ((Yin, 1994) also cited in Lofthouse, 2001)), emphasises the importance of replication rather than sampling in multiple case studies and explains that,

“Each case must be carefully selected so that it either (a) predicts similar results (a literal replication) or (b) produces contrasting results, but for predictable reasons (a theoretical replication).”

In this instance, cases were selected to predict similar results. The multiple ‘action research’ contexts chosen were: University of Hertfordshire (product Design Students) and The Ford Motor Company (Advanced Product Group). The table below summarises the participants involved in testing the developed Empathic Design Processes. (Ford and UH: Project Specific)

In accordance with ‘action research’ methodology, feedback was collected or observed in a number of different ways, including:

- A combination of open ended and focused interviews were carried out with selected participants in order to obtain feedback
- Observed presentations took place after specific techniques were implemented
- Concept proposals and communication of customer understanding was assessed against pre-determined criteria.
- Designers were observed using the tools
- Where possible concept designs were considered.

### 3.5.5 Qualitative or Quantitative Data

This research study is best suited to the collection of qualitative data when considering a number of key factors. Firstly, the richness of data required in an emergent subject area, and the observation and participation in specific cases does not lend itself to quantitative data collection or analysis.

Qualitative data is better suited to researchers who concern themselves with ‘issues related to human behaviour and functioning’, but that these “...methods can be used to uncover and understand what lies behind phenomenon about which little is yet known” (p.19) (Straus and Corbin, 1990)

Qualitative techniques are well suited to the collecting of, views and opinions, observations, experiences reactions and comments. During both the pilot and main research studies the richness of data was maintained through raw data collection formats, which included: video recording, audio recording, notes, powerpoint slides, drawings and photographs.

### 3.5.5.1 Data collection Techniques

The richness nature of the in-depth data required, is inherently qualitative in nature. Please see table Figure 3.10, (Page 66) to demonstrate data collection techniques used during phases 1,2,and 3 of the research, together with data sources and mechanisms shown in appendix A, (Pages A-G). Within this research study each data collection techniques has been selected primarily for its appropriateness to the situation, and to maximise the richness of data available.

Throughout each phase of the research study, interviews with individuals or teams were carried out in order to better understand individual or team perspectives and to gauge opinions. In order to maintain rigour, these interviews would take one of three forms: 'unstructured', 'semi-structured' or 'focused'. Each of these interview types would adhere to a combination of question types: 'unstructured', 'semi-structured' or 'open-ended', used as appropriate. Care was taken to ensure that where possible, questions were prepared in advance, questions were not leading, in open-ended enquiry answers were not guided. Conversations were either audio or video recorded and interviews written up as suggested by Robson, (1993). Please refer to appendices A and B (Pages A-N). Observations were video recorded, and where concepts, drawings and artefacts are regarded as data, they are photographed. Observational data was transcribed as necessary during analysis. Recorded observations were reviewed by the participants within research 'case studies' where necessary, in order to ensure accuracy.

It is important to note that since much of this research study is exploratory, and many of the techniques employed were done so speculatively, it is often the case that the precise nature of the data are unknown prior to collection

### 3.5.6 Data Sources

The main data sources for the pilot project were specific innovation projects within two industrial cases within the automotive and product sectors, supported by industrial design projects at the University of Hertfordshire. (See appendix A-3). The main study was based on data from a number of sources from three related cases; all 'live' projects across industry sectors, supported by Industrial design students at the University of Hertfordshire.

The type of product outcomes delivered during these projects; that is the 'vehicles' by which process is applied is of less importance

during this study. It was considered by the researcher that these projects should be regarded as innovation projects and conducted by teams actively focused on the earliest stages of an industrial design process. Given that these projects were also driven towards radical innovations and processes, they could be qualified as 'innovative ideation' and were supported by concept development'. These projects are conducted in parallel to commercial industrial design research and tend to be undertaken for exploratory or educational purposes (though they also feed directly into mainstream development projects). They do however integrate with the development and product portfolio of a given industrial project. Concept design projects conducted as 'live' collaborations also subscribe to a less rigorous interpretation of completion, in that these projects may not directly result in new concepts, nor are they directly reviewed for that purpose. These projects and outcomes are afforded the opportunity to evolve and inform development streams. This makes 'success' an illusive measure. The results are seen as useful even if they do not culminate in resolved design responses.

### 3.6 Prototype Methodology as a data collection mechanism

A prototype Empathic Design-derived methodology was developed as a mechanism for collecting data and not as a finished 'product' or definitive methodology. Deliberately flawed and non-prescriptive methodology presents opportunities for discussion to facilitate the understanding of industrial design ideation process, specifically with respect to customer understanding. This also provided the supporting projects within which design briefs could be manipulated and understood.

"A prototype is something you can touch, put in your pocket, play with in your hands. You can literally weigh it up. Prototypes are a fantastic way of evoking new insights and builds, and of checking what works and what doesn't as soon as one prototype is finished and has been interrogated, a new one can be started... the real value comes from looping the loop (p.111)... prototypes are rough and ready. That's part of their charm. They are the best you can do with the time and the available resources. If a prototype is too finished, it actually stops people commenting. If it's that finished, they think, then it's no longer under development." (p.118) (Allen et al., 1999)

Prototypes and design or test-rigs are regularly used during design and development processes and as such are familiar tools for industrial designers to respond to. It was anticipated that this type

of mechanism would integrate with current industrial design culture and practise in a more intimate manner than other data collection techniques. It was also more likely to yield a rich insight into the industrial designers ideation process and the integration of customer requirements into that process. This approach would also build an understanding of how designers applied and responded to prototype tools and techniques proposed in this enquiry. Using this type of prototype is a recognised mechanism for obtaining critical feedback (Allan et al., 1999) and a common approach used in design practise. This developed Empathic Design methodological framework consists of a number of specific tools, techniques and processes that were reflected upon and developed through a number of iterations as new insights were uncovered and a deeper understanding of the nuances of this process developed. (described in more detail throughout the main study). Each iteration of the tools, techniques and processes yields new insights, and develops a deeper understanding of the detailed processed industrial designers practise which, facilitates further iterations: 'The Loop'.

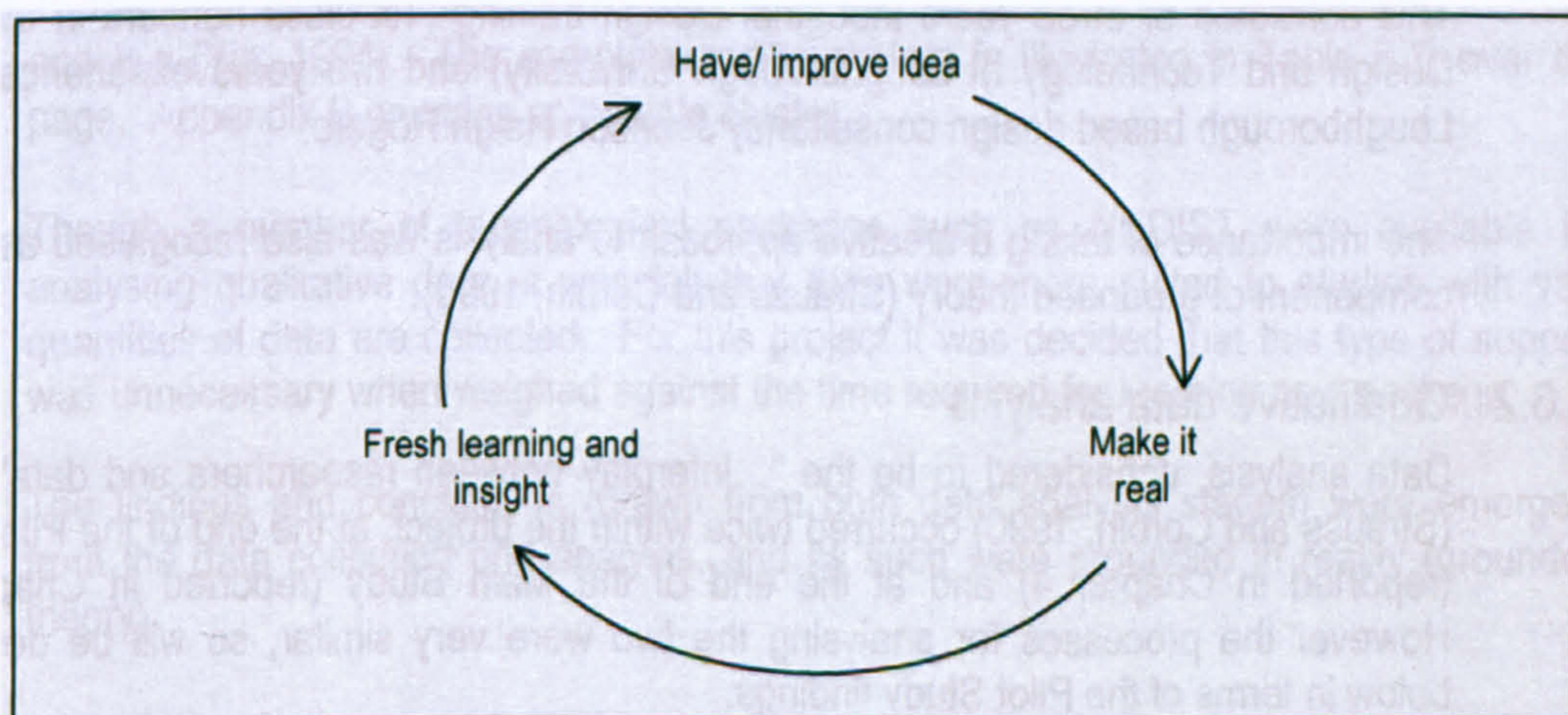


Figure 3-5 The loop (Allan et al., 1999)

### 3.7 Data analysis

#### 3.7.1 Coding and clustering

The coding procedure in qualitative research derives meaning from words (Miles and Huberman, 1984; Robson, 1993), by allocating codes to specific data, then grouping those with similarities. Data were transferred to into computer format (where possible), interviews transcribed, and video recorded observations, coded. (See appendix D for interview transcript) and (See Appendix E for



workshop transcript, drawn from video). Comments were coded using predefined code systems to organise data into appropriate categories. These codes were then clustered according to the in the pilot study and throughout, according to their meaning.

### 3.7.2 Final Codes

Though the codes were predefined through the exploratory pilot study to the main study, they were developed throughout data collection and analysis. As the research study progressed, these clustered properties became less fluid for the purposes of validation and confirmation. The final code clusters and properties are shown in appendix A and clusters are summarised below:

- Info: dealing with 'customer understanding' information and stimulus for the design process and industrial designers
- Pro: Data regarding the design processes followed by industrial designers and the characteristics of these processes and projects
- Innov: broadly dealing with the nature of innovation and design responses undertaken by industrial designers.

## 3.8 Grounded theory

### 3.8.1 Definition of Grounded Theory

Grounded Theory is a term applied by Glaser and Strauss (1967) in order to describe the type of theory produced by their methods of ethnographic data collection and analysis. Grounded theory emphasises the systematic discovery of theory from data, so that theories remain grounded in observations, rather than being generated in the abstract. In the case of this research study, theories are grounded in observable experiences, but the researcher adds their own insight into why those experiences exist.

### 3.8.2 Grounded Theory in this Research Study

The research reported in this thesis has emerged through this study and is therefore considered to have used a grounded theory approach. A defined field of study rather than existing theory gave rise to the initial research project that include Industrial Design, customer understanding in the design process, and specific industry case(s) in this Case Nissan, MIRA, University of Hertfordshire. This was allied to a recognition that the role of the industrial designer was changing; in terms the timing of their involvement, the questions they were being asked of their customers and the value of

their contribution in terms of innovation and concept generation. However there were few examples to show that this was happening. Through the collection of data and the development and testing of new design methods, theory regarding current problems with industrial designers' customer understanding and communication, and the potential solutions have emerged.

Strauss and Corbin (1990) recognise that theoretical sensitivity is an important aspect of grounded theory, as it allows researchers to "recognise what is important data, and to give it meaning" (p.46). It is also considered to spark insight in analysis. The author's sensitivity to this subject area has manifested in two ways. Firstly, extensive reading around the subjects of industrial design, user-centred design, customer understanding in design, and the specific cases of the companies involved. Secondly, through the author's industrial design background: three years training (2:1 Honours degree in Industrial Design at the University of Hertfordshire), A number of collaborative design projects specifically investigating customers needs; significant industrial design experience integrating user requirements into specific products for adventure sports and special needs; and three years teaching experience on the product design degree programme at the University of Hertfordshire. Strauss and Corbin (1990, also recognise that taking a creative approach to analysis is another vital component of grounded theory.

### 3.8.2 Questions of validity

For exploratory case studies, Yin (1994) describes research design quality in terms of construct validity, external validity and reliability. Although these terms have not been referred to throughout this chapter, these issues have been considered during the design of this research study. Consideration of these issues is summarised in the table below:

Requirement for research design quality	Method of Achieving quality
Construct Validity: (establish correct operational measures for the concepts being studied)	multiple sources of evidence were used and multiple data collection techniques (triangulated data); draft reports on collaborative companies were reviewed by key participants; drawing comparisons with similar methods
External Validity: (establish the domain to which a study's findings can be generalised)	replication was used across the selection of research participants.
Reliability: (Demonstrating that the operation of a study - such as the data collection procedures can be repeated, with the same results)	Case Study protocol was adhered to in terms of Project aims and objectives; consulted background literature; outlined information sources; implemented data collection in rigorous manner; tabulated findings with references to sources.

### 3.8.3 Qualitative Data Analysis

Formal data analysis took place at two key stages of the research study. The first opportunity to analyse data occurred following phase 2 (the pilot study, reported in chapter 4), and the second following the main study (reported in chapter 5). The processes of analysis were similar across both studies, and so will be described in terms of the pilot study findings.

Data analyses, is described by Strauss and Corbin (1990) as "the interplay between researchers and data."

All of the data analysed as part of this research study has been qualitative in nature and so determined the type of data analysis that would be used. 'Coding and clustering' is recognised procedure for analysing qualitative data and has been adopted for the analysis within this study because it has allowed the researcher to derive meaning from observations and words, and to build theory upon that data. (Miles and Huberman, 1994; Robson, 1993; Strauss and Corbin, 1990).

Robson categorises a code as " a symbol applied to a group of words to classify or categorise them. They are typically related to research questions, concepts and themes." (Robson, 1993)

This process has been adopted during this research study to cluster together instances of a specific nature, to facilitate theory building and the generation of hypotheses.

In preparation for the analysis, raw qualitative data; recorded as photographic or video evidence was transferred onto digital format, or edited where possible.

This data was then separated into data threads consisting of observations, comments and opinions and supplanted onto a coding system. Each code represents a specific phenomenon relating to industrial designers and their participation in practises of customer understanding.

Data threads were grouped into clusters, where a second (micro) coding was applied in order to define incidents in greater detail. Coding design practice is by no means conclusive. It does, however, provide a framework capable of mapping specific nuances of a discipline often conducted individually and in a manner that is rarely replicated exactly. In this instance, codes were rated according to recurrence and importance, Recurrences refers to the frequency of incidents and importance refers to the level of significance. Both relate to industrial designers practise, rather than specific customer activities or behaviour.

It is important that the level of importance attributed to specific codes has been informed by the researcher in two key ways: specific subject knowledge and the iterative process of inductive research by which the study has been conducted. This process does not require incidents to be recognised by additional researchers in order to be considered important. This is advantageous in what is an emergent area of research. (See table of complete coding system – illustrated).

The findings and research conclusions (extracted from current data analysis) emerged through the collection and analysis of data that were grounded in reality and as such constitute grounded theory.

### 3.8.3 Hypotheses and development testing

Within the study, a number hypotheses were developed through the initial empirical findings of the exploratory pilot study and through the review of literature. These hypotheses were tested using the findings that emerged from the main study and through multiple testing of the developed Empathic Design methodology. Illustrative quotes are used to support, prove or disprove elements of hypotheses.

### 3.9 Bias

Opposing theoretical sensitivity is the issue of bias. This occurs when the perception of the researcher takes precedence over participants' views and understanding of a situation. Yin, (1994) proposes a number of skills in order to reduce bias. These skills were kept in mind throughout all phases of this research study:

- Be able to ask good questions and interpret the answers
- Be a good listener and not be trapped by ideologies and preconceptions
- Be adaptive and flexible in order to recognise opportunities and not to see them as threats
- Have a firm grip on the issues being studied.
- Be unbiased by preconceived notions (whether derived from theory or practise).

Yin also proposes that case study research needs to avoid "substantiating a preconceived position". This research bias can be reduced if researchers discuss unusual or contrary findings with colleagues during data collection. Peer reviewed papers throughout this study have been presented at international conferences in respect of these issues.

### 3.10 Summary of Methodological Framework

The research design for this project can be summarised as follows:

- The purpose of the study was to carry out an exploratory study to provide new insights into the practise of customer understanding adopted by industrial designers
- A multiple research strategy which combined the strengths of multiple case studies and the development of an Empathic Design methodology were used during the exploratory pilot study, whilst multiple cases were used during the main study.
- This research investigation was driven by the requirements of rich data and the qualitative nature of people centred research situations.
- Data was collected from multiple sources through multiple data collection techniques, consistent with case study research; literature review, interviews, active and passive observations in true context etc.
- The data were analysed using a coding and clustering methodology common in qualitative analysis.

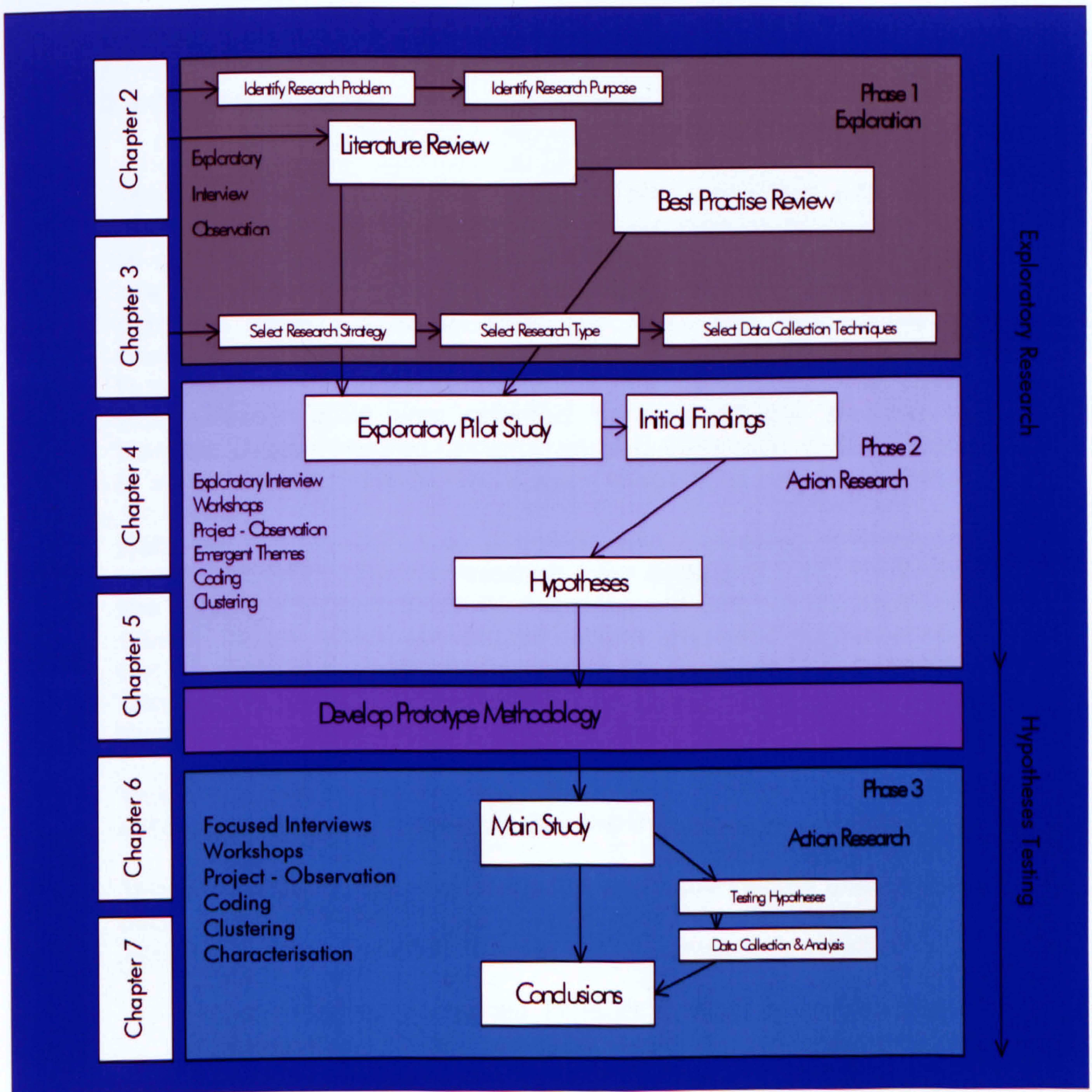


Figure 3.10 Illustration of Research Design

## 4.0 Phase 1: The exploratory Pilot Study

### 4.0.1 Chapter Summary

This exploratory study was designed and conducted with respect to the requirement for multiple data collection techniques in order to collect empirical data from collaborating cases via a series of specific projects, workshops, interviews and observations. The subjects were industrial designers from the automotive and consumer product sectors, together with product design students. It is important to note at this point that the participating student design programme was selected because of the training bias towards people-centred design (referred to as user-centred design in section 2.1). These students were adopted as primary subjects.

Data were analysed using a coding and clustering methodology, recognised in qualitative research (see section 3.7.1). Throughout the coming chapters illustrative quotes are used to emphasise the main findings whilst operationalisations are used to demonstrate the applicability of the findings and to illustrate the nuances of specific industrial design practices. All direct quotes are attributed through this coding system. (See appendix A).

This chapter presents findings, which were deduced from empirical data analysis via key research themes that were identified.

These themes emerged through the literature review and empirical data. Two key activities took place during this pilot study:  
The findings were used to answer the first research question:

- How does, an 'Advanced Product Design' team (involved in the earliest stages of new product development; pre-concept), integrate customer understanding into their design process?

Secondly, this study was used to develop a number of hypotheses that were tested using the findings in the main study.

### 4.1 Background to the Pilot

This section describes the pilot project; an enquiry based predominantly on data from industrially grounded innovation projects supported with industrial design degree projects. That is projects that focus upon the earliest stages of the product development process.

For the purposes of this chapter these stages will be referred to as ideation. Few examples, and practise within this subject domain, required the researcher to adopt an action research strategy. This was seen as the most suitable methodological approach In an emergent area the researcher is afforded some control as an intervening practitioner. It must also be noted that it is unlikely that projects with this level of customer focus would not have been conducted without the intervention of this researcher.

#### 4.1.1 Research Questions and Focus

Before entering into this project and presenting its findings, the research objectives and questions will be reiterated as a reminder to the reader. The literature presented the Kano model of customer delight highlighted three forms of innovation that can drive customer delight through increased customer understanding. These were:

- Incremental innovation or improvement
- Distinctive innovations
- Disruptive or breakthrough innovations  
(Defined in section 2.7).

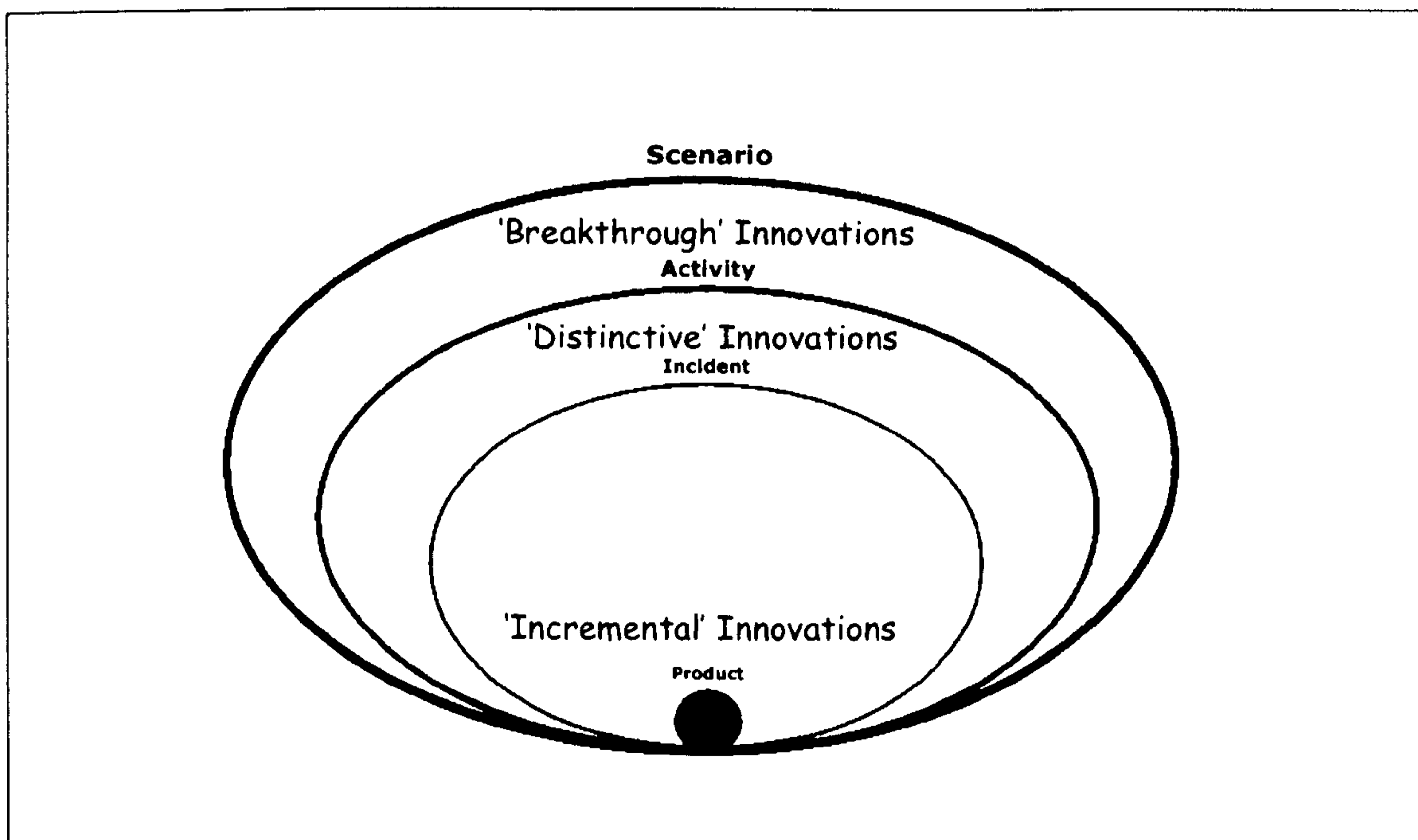


Figure 4-1: Levels of Innovation (Barrett, 2004)

Design-led innovations tend to be distinctive or disruptive innovations. This pilot study will seek to explore characteristics of the conceptual development of disruptive or breakthrough innovations,



seeking to impact upon customer behaviour. This is visualised in figure 4-1 and is undertaken using the stated research questions:

### 4.1.1.1 The research questions:

- How does an 'Advanced Product Design' team (involved in the earliest stages of new product development; pre-concept), integrate customer understanding into their design process?
- How do industrial designers conduct customer-focused design?
- How do designers participate in 'customer understanding' processes?
- What are the characteristics of the earliest stages of customer-centred industrial design?
- How do industrial designers communicate customer understanding across design audiences?

### 4.1.2 Overview and approach to the Pilot Study

The pilot study design consists of a concept design project treated as a case study, supported by two industrially grounded workshops aligned to the CUPID Project (Customer Understanding Processes in Design). These three key studies were conducted consecutively as follows:

- CUPID Co-creation workshop: Cranfield University in Collaboration with Nissan European Technical Centre and MIRA (Motor Industries Research Association).
- Product Configuration Project: University of Hertfordshire in collaboration with the researcher
- Essential Customer Intimacy Co-creation workshop: In collaboration with Cranfield University and The Design Council, UK. Aligned to the CUPID Project.

For the project stage of the pilot study, Industrial design students were adopted as subjects for a number of reasons including:

- Fewer preconceptions regarding customer understanding
- Willingness to adopt new design methodologies
- Industrially grounded collaborative projects provides near naturalistic context
- Fewer product-specific design conditions
- Researcher can pilot, pilot techniques
- Researcher is often afforded greater level of time out of studio
- Facilitates replication of specific design practises
- Consistent assessment and validation criteria over an increased sample size.

### 4.2 Area of Study

The approach to the pilot study was specifically oriented towards developing a deep understanding of an industrial designer's approach to customer understanding, and the integration of this understanding into the earliest stages of the product development process; namely the practises of idea generation and concept development. The early stages of product design and development when considered in an industrial context were considered to be both a stage and a department or team within the product development process. They may either be regarded as an 'Advanced Product Group' or Concept Design team. Within an educational context, a product design programme was selected on the basis of its applicability to the 'ideation' process and the earliest stages of product design development. There is also little work dealing with the integration of customer requirements at a departmental level within industrial design contexts either in educational or industrial contexts.

Although designers don't often practise direct customer observation, they do practise the integration of customer requirements in the service of ideas, ultimately in the development of products. So what do industrial designers need in order to better understand customers? Anecdotal and Empirical data already acknowledges both the need for industrial designers to better understand customers and cannot confirm that appropriate tools even exist (Hummels, C., Overbeeke, K., 2000). However, Empathic Design has been proposed as a methodology that may be appropriate to industrial designers (Leonnard and Rayport, 1997). This study proposes to explore the adoption of an empathic design methodology by industrial designers' to:

- Better understand customers
- To integrate customer requirements into the idea generation and concept development stages of a product development process.

This chapter presents initial empirical findings that refer to the practice of customer understanding as adopted by industrial designers. It will use specific operationalisations to illustrate the shortcomings of current tools and methods, and will begin to consider the appropriateness of current methods, (an issue that will be discussed throughout this chapter). This chapter will also begin to examine the opportunities that may be uncovered through the development of an appropriate methodology for industrial designers' to understand customers'.

This pilot study consists of one concept development project undertaken at the University of Hertfordshire's product design degree programme. This project is supported by industrially grounded events and workshops; Co-Creation: the observation of a number of industrial designers across industrial sectors, and Design in Business Week 2000 supported by the design council: designed to create a platform to observe elements of an empathic methodology across industrial design sectors. These will all be presented later in this chapter. These individual projects, when considered collectively allowed the researcher to observe all key aspects of an industrial designers interpretation of an empathic design methodology.

These projects were selected and designed as the pilot study in order to consider a number of relevant factors important to this research:

- Open and innovative, with enough freedom for exploratory research and design. The core project has a short time frame (10 weeks) and could be designed to accommodate tangible outcomes. These projects were 'live'; that is they have agenda's beyond the scope of this research (See appendix C). this ensures that the research could be conducted through naturalistic industrial design processes.
- These projects contain both demand (lifestyle) and supply side (technological) considerations that is suitable for the adoption of an empathic design ethos: "Bringing together what is possible with the real needs of customers". (Leonard and Rayport, 1997).

The primary design project within the pilot study was presented to the University of Hertfordshire as an introduction to Empathic Design and also served as an introduction to the researcher. This was accepted with possibilities for further studies between Cranfield University and the University of Hertfordshire, though this would be dependent on the achievement of learning outcomes.

### 4.3 The Projects: Customer Exploration

The primary project for the pilot study was a level 2, degree module on the Product Design Scheme at The University of Hertfordshire. The required objectives and learning outcomes for this project are outlined below:

- Show evidence of a valid investigation of the (product) configuration from first principles.
- Show an appropriate level of understanding of how existing products work, their components and construction.
- Show evidence of valid ergonomic investigation.
- Have made and tested hypotheses, and exhibited awareness of the process involved.
- Demonstrate an ability to make development decisions and define the criteria used.
- Have made presentations which clearly communicate the above qualities and experiences

This specific module is concerned with challenging assumptions that may be made by an industrial designer during the early stages of new product development. It begins with the premise that valuable product design can arise from the questioning of existing prejudices, and can lead to new perceptions and service new ideas. This project asks students to examine and challenge the fundamental configuration of familiar products; that is familiar to a presented target marketplace. If possible, these projects bring to bear new applications of form, technology or imagery. The project deliberately prescribes orthodox solutions and forces the student into radical possibilities, which must be based upon real needs of customers. (Full course aims can be viewed in Appendix C.)

**Product Configuration: A traditional task analysis brief**

(The full brief is available in appendix C)

The brief: to develop a new concept for one of four products:

- Image Scanner
- Hairdryer
- Coffee machine
- Vacuum Cleaner

“It is essential as a designer of objects, not to accept the norms as assumed. If we were to do that, we would not only fail to put ourselves one step ahead of the customer but also ensure that our product development stands still, which is exactly the opposite of what our clients require of us. Having said that, formats may be stipulated in a brief, or the sensible solution may be the one in current use. That doesn’t stop us reconsidering it! Very often a Product Designer’s main contribution comes from a fresh approach to existing solutions, and there is a particular bracket of products where in any case, no standard format exists. In these instances, the product will arise out of the design analysis of the function, but more importantly from observing the scenario of use.” (Richard Barrett, 2000).

The project brief is separated into two phases: customer investigation and concept development. During phase 1, the researcher intervened into what would have been typical task analysis following specific developments to the Empathic Design methodology proposed by Leonard and Rayport, (1997). The researcher was careful to select interventions only on the basis of developments made to the original proposal of the current Empathic Design approach by Leonard and Rayport (1997). Any interventions made must not guide or condition the participants towards specific methods or design outcomes. The interventions were designed to keep the practices of the design participants as naturalistic as possible, though it should be noted that any intervention into complex design processes are likely to impact upon the actions of the participants. The developments to the Empathic Design methodology will be highlighted later in this section.

Phase 1: Activity Scenario

This phase of the project focuses on the ideation process. It presents the brief as the knowledge and understanding of what it is that actually needs to be designed. It is made clear that by observing customer needs and investigating potential technologies will industrial

designers be in a capable position to write a design brief. It is also made clear that this is a 'clean sheet' project; that is with no specific product-led constraints. Participants are required to assume that none of the existing products necessarily meet the requirements defined by this project phase. This is therefore a design process from the first principles of an Empathic Design methodology. During this phase participants were asked to consider the following:

- What it is used for
- Where it is used
- Who uses it and why

Participants were then asked to consider how the above can be better achieved, and to consider the product form the following perspectives:

- The users standpoint
- On a functional level
- Production and materials

This was presented as a holistic approach that considers a design proposal from multiple perspectives. It has been designed to challenge pre-conceived ideas, and also to highlight opportunities to develop new solutions. Both radical, and rational approaches were considered by participants. this phase would identify the drivers for the development process, and identify a specific product design brief, generated by industrial designers. (See figure 4-3).

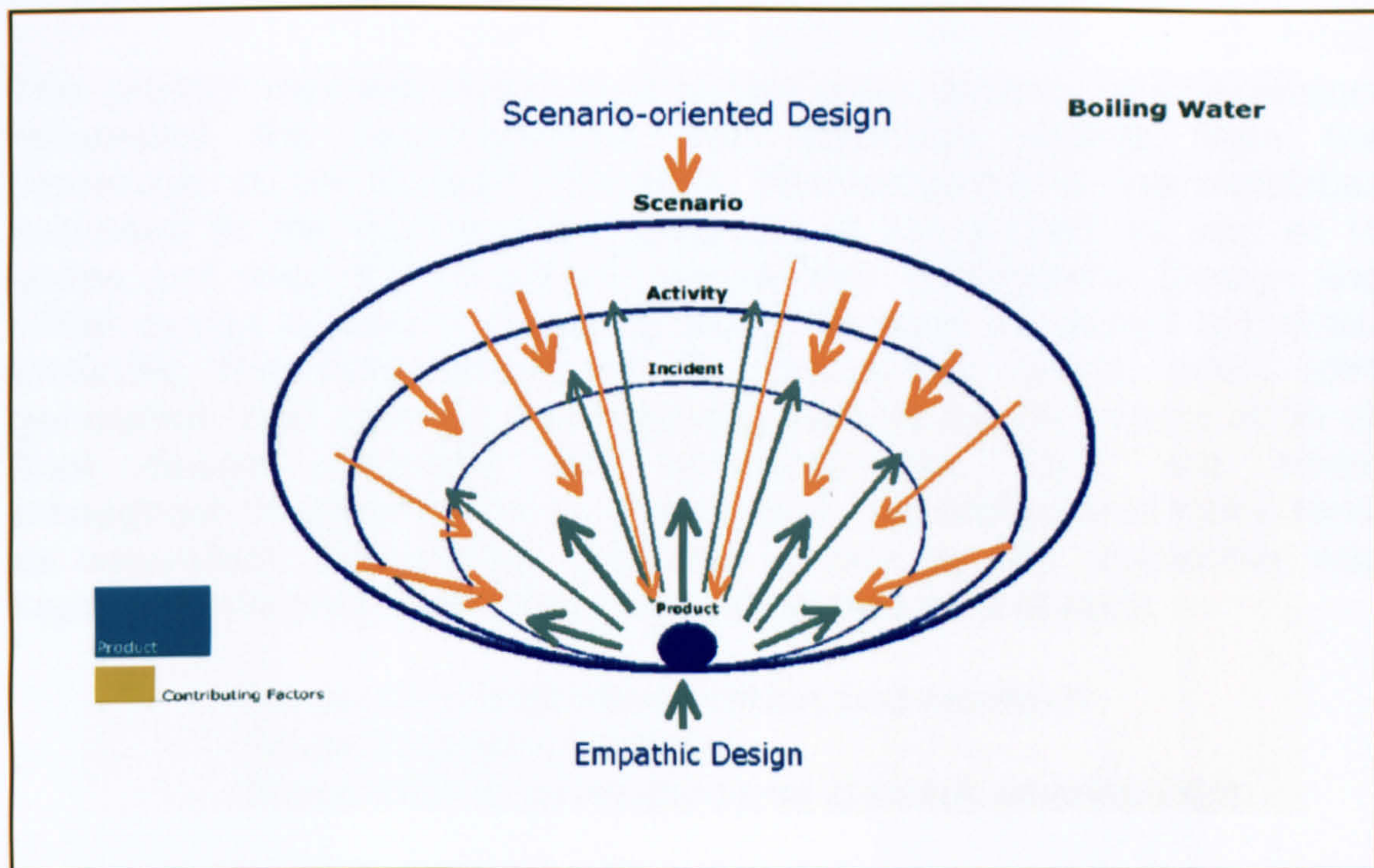


Figure 4-3 Empathic Design's affect on lives of customers' (Barrett, 2000)

### Product Critique: the research start point

Industrial designers frequently appraise and assess competitor products. In this project this was developed into an exercise to explore an industrial designer's practise of relating this assessment to the customer experience for which they will be designing. It will also form the basis for initial observations of industrial designers' communication of customer understanding amongst colleagues and peers.

### Phase 2: Development

During this project, development was conducted as a concurrent activity. It was conducted alongside the scenario investigations and the research. Participants were reminded that the purpose of the project was to design into an experience and not just to produce another product. The development phase refers to concept development where an idea is transferred into a design concept through the development of test rigs, drawings and models. In this project, the development phase was used to observe industrial designers assessing product concepts against customer focused criteria identified by the designers themselves.

The project was scheduled over a ten week period. As the project developed the responsibilities and emphasis shifted from the researcher to the student designers. The researcher's responsibilities extended to the initiation and proposal of the project as well as to shape and steer it through the introduction of Empathic Design and initial design research. Students would conduct all design activities, including the development of an appropriate design brief, idea generation and concept development as well as the preparation of final design proposals and communication. Care was taken throughout these projects to ensure that the design processes were as naturalistic as possible, and intervention by the researcher was kept to a minimum. The project was designed as 3 stages:

- Stage 1: project identification and research
- Stage 2: product critique
- Stage 3: idea generation and concept development

### 4.4 Project identification and Research

This stage consisted of a series of meetings and discussions between the collaborating programme and the researcher and agreed details such as the scope of the design brief, workload placed upon design students, ethical issues associated with direct customer observations, levels of guidance afforded to the students as well as allocating key responsibilities.

#### 4.4.1 The research phase: Project Information and Stimulus

This stage of the project was supported by the research in the form of lectures and workshops introducing the students to the empathic design methodology. This 6-week research phase aimed to collect wide ranging and relevant customer focused stimulus for the project. The methods by which this stimuli could be collected was left to the participants in as far that the information must use an inclusive rather than exclusive approach and that the information would enable participants to get closer to their customers so that the information can be used to inform an industrial design process. For the purposes of this study, students were required to intimately understand customers using primary sources. For example, direct observation. This information would impact upon stages 2 and 3 as the observed needs of customers would form the criteria by which an existing product would be assessed and inform the idea generation and concept development processes. This research would be conducted as design teams dependent upon their product selection. This



information could then be used on an individual basis through stages 2 and 3 of the project.

#### 4.4.2 Watching us, watching you? Observing designers observing Customers

In order to control the introduction to Empathic Design and to relate to an industrial designers learning culture, a workshop and seminar was selected to introduce the principles but not specific methods of Empathic Design: (Leonard and Rayport, 1997). The participants consisted of 32 Industrial Design Students from the University of Hertfordshire. (See figure 4-4)

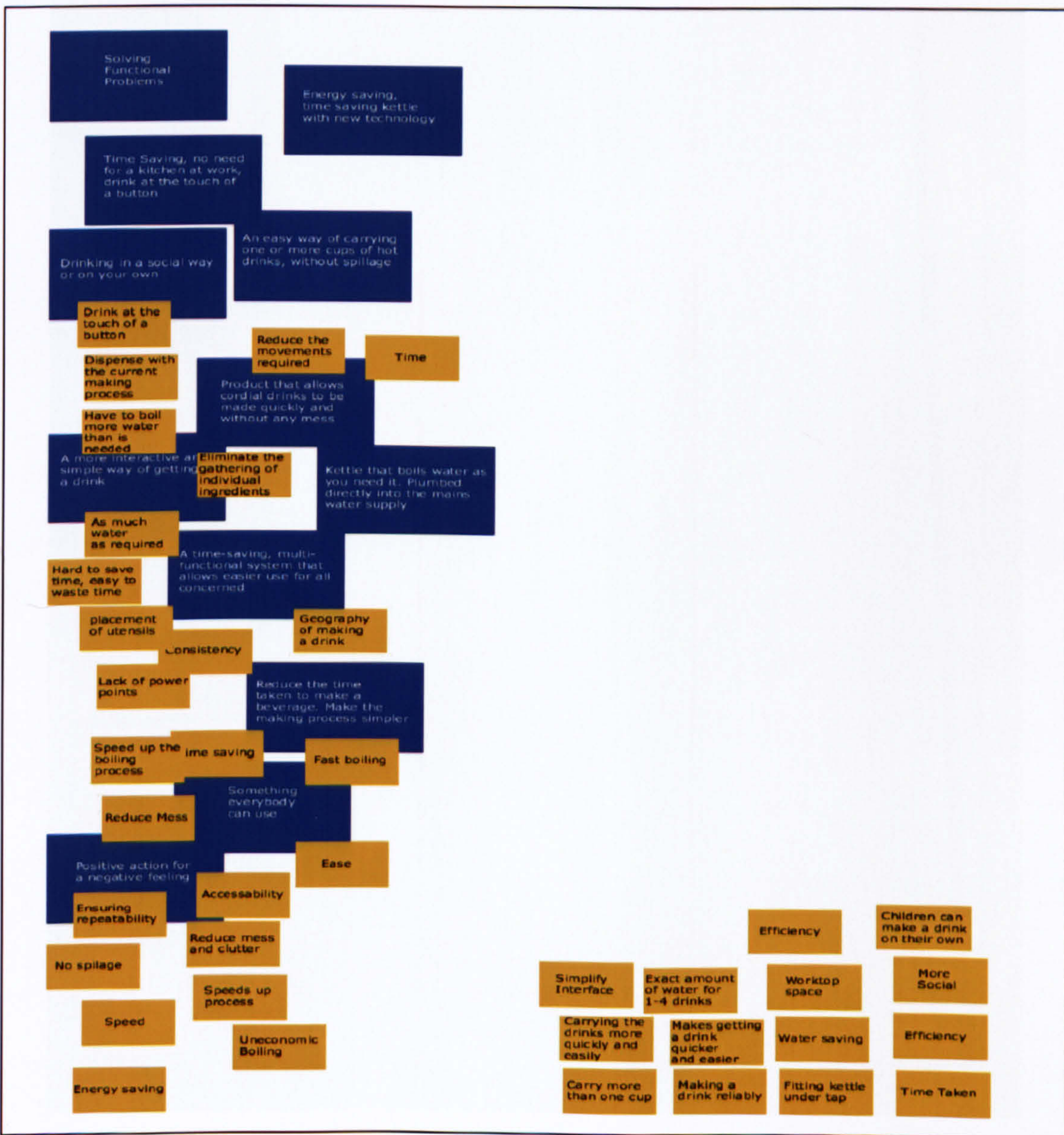


Figure 4-4: Example of 'Needs Prioritisation' output (Barrett, 2002)

Figure 4-4 is example output from a 'needs prioritisation' exercise used in part as an introduction to Empathic Design. Design participants were introduced to a design problem concerned with a product familiar to the design participants; in this case the subject was dishwasher use. They were also presented with target market of elderly and/or disabled users. Participants were asked to look at the existing product (s) and summarised written data relating to the target market and then to write (in yellow) target customers' needs in relation to this product. In small groups, the needs were prioritised so the most important were placed at the top. The design participants were then exposed to real life footage of dishwasher use by the target market produced by the researcher. In real time, the participants were asked to write (in blue) needs not previously articulated in the previous part of the exercise. In the same teams, participants re-prioritised the customer needs. Sample output from one team is shown. This exercise was designed to expose the importance of understanding and empathising with customers.

It was recognised that projects of an exploratory nature may be restricted by operational constraints, which may impact on the creative flow of ideas and the project development. With this in mind, the design and the collaborative processes would develop concurrently with product concepts and ideas to facilitate both exploratory design and research. Here is a summary of the introductory workshop:

Students were introduced to the purpose and principles of Empathic Design using accepted definitions and data. This included:

- Examples of collected data: direct observation conducted in advance by the researcher.
- Understanding the real needs of customers: the latent and tacit needs of customers
- Observation versus inquiry: customers only respond to what already exists
- The changing role of industrial designers in the briefing process
- The benefits of observation in true context
- The power of communicating rich video data

In order to communicate the value of observation as a research tool when considering customer understanding a short exercise took place: (Cited as 'Needs' prioritisation: The Empathic Design Tutor, Evans, Burns and Barrett 2002). (See figure 4-4)

Participants were asked to consider a user-centred task connected with a defined user group: specifically, loading a dishwasher conducted by elderly users. As 4 design teams each consisting of eight team members, participants were asked to identify customers' needs based on their tacit knowledge and experience and to prioritise those perceived needs. Participants were then asked to view a short (10 minute video) of elderly users interacting with a number of dishwashers and in real time, consider the observed needs. Participants were then asked to reappraise the needs of customers'. (An excerpt can be seen in appendix D).

### 4.5 Stage 2: The workshops: Co-creation

The core project within the pilot study (explained above), was supported by industrially grounded one-day workshops: these comprised of two co-creation events, the first supported by Cranfield University and the CUPID Project (Customer Understanding Processes in Design) and the second supported by the Design Council and the Design Museum.

The aim of these workshops was to bring together industrial designers from a number of industry sectors (Participants in one event included: Nissan European Technical Centre, MIRA (Motor Industries Research Association), Electrolux, Berghaus and Industrial Design consultants PDD) to better understand the nuances of industrial designers' approaches to; understand approaches to ideation and how aspects of an Empathic Design approach may impact upon that process. (See sample workshop agenda and transcript in appendix E).

#### 4.5.1 Co-creation workshop 'Ideation session': event 1

##### Description of the Workshop Process

##### 4.5.1.1 Co-creation event 1:

(See Co-creation guide Appendix E). Part 1 of the workshop introduced the principles of Empathic Design as proposed by Leonard and Rayport. This was followed by a 'real time' identification of customer needs. Empathic Design observation prompts were available throughout this process. Part 2 oriented industrial design participants towards idea generation based on the observed needs of customers through controlled design tasks. The participants were split into two design teams: and asked to refer to specific observational data in order to generate solutions for vehicle loading and storage:

#### 4.5.2 Project Focus

The project focus was to generate requirements relating to the shopping journey of a vehicle. Stimulation gleaned from 'Empathic Design's' customer understanding processes were presented to half of the participants whilst the other created a cast with a fictitious storyline that is deliberately flawed. This combination of expert users and flawed stories, combine to generate an accurate map of a given scenario. (See Figure 4-5 and 4.5b)

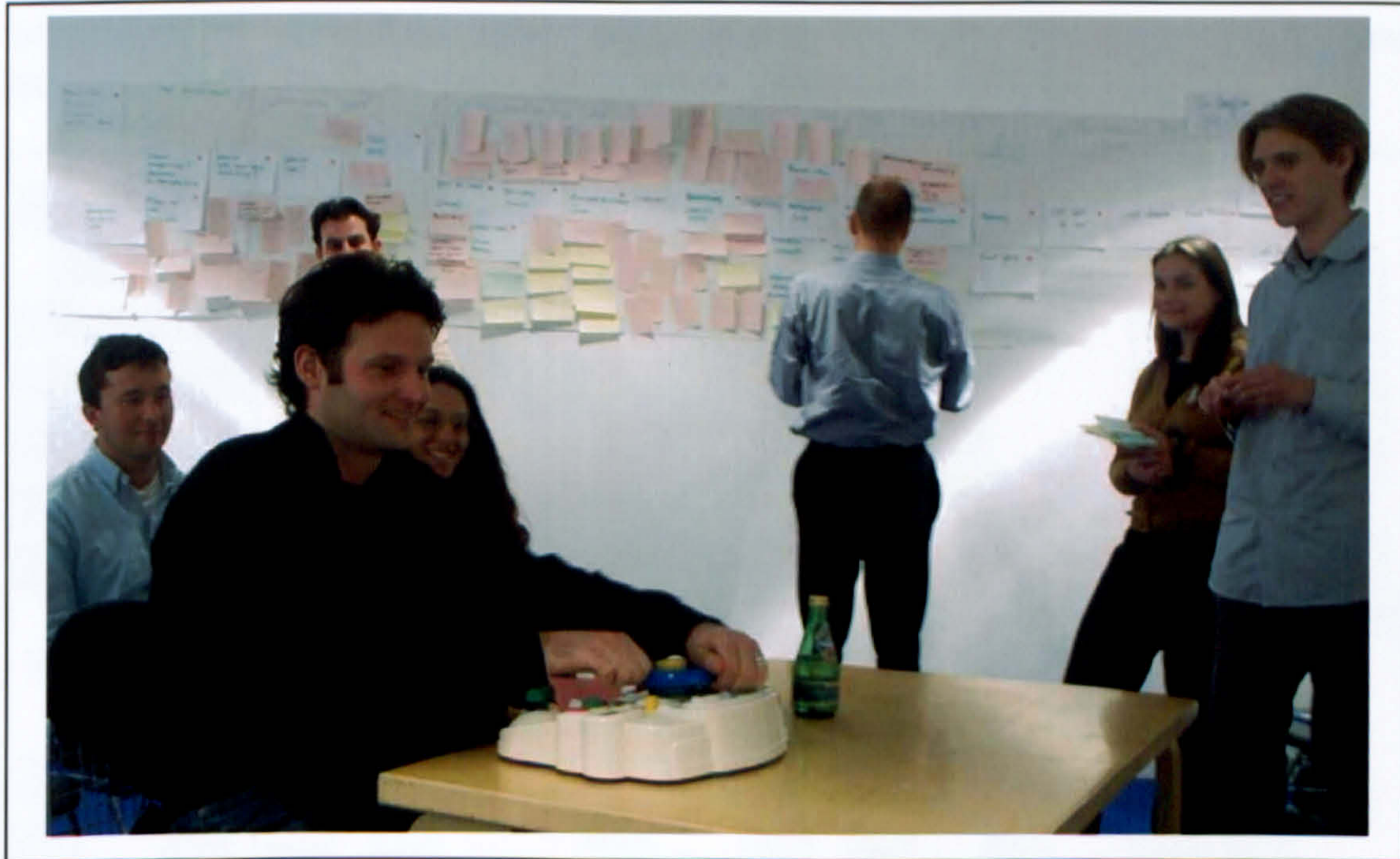


Figure 4-5: Co-creation Workshop (Design Council UK + Author)

Figure 4-5 shows a real-time role-play activity where two participating design teams 'Act' and 'Map' a storyline. Target customers form the audience to respond the cast and the designers suggesting true actions, solutions "What I need is..." and alternative situations.

#### 4.5.3 Designer Observation

Designers were now in a position to observe customer data and question their assumptions of specific customer activities. These assumptions, are triggered by flaws in the presented 'customer contexts'. And direct 'customer understanding' can respond to those flaws in real time and are designed to create an accurate map to further stimulate 'customer understanding' and ideation processes. Observing design practise in the true spirit of Empathic Design

uncovers the real needs of industrial designers during their ideation and concept development processes. (See Figure 4-5)

#### 4.5.4 Map Generation

In order to support ideation processes, scenario maps were generated to allow designers to identify and priorities customer needs. These identified needs could then form the stimuli for ideation and concept development processes. (these mapping methods) do not appear as part of the existing Empathic Design methodology. The adoption of a visual map was found to help designers ask new questions of the contexts they were designing for.

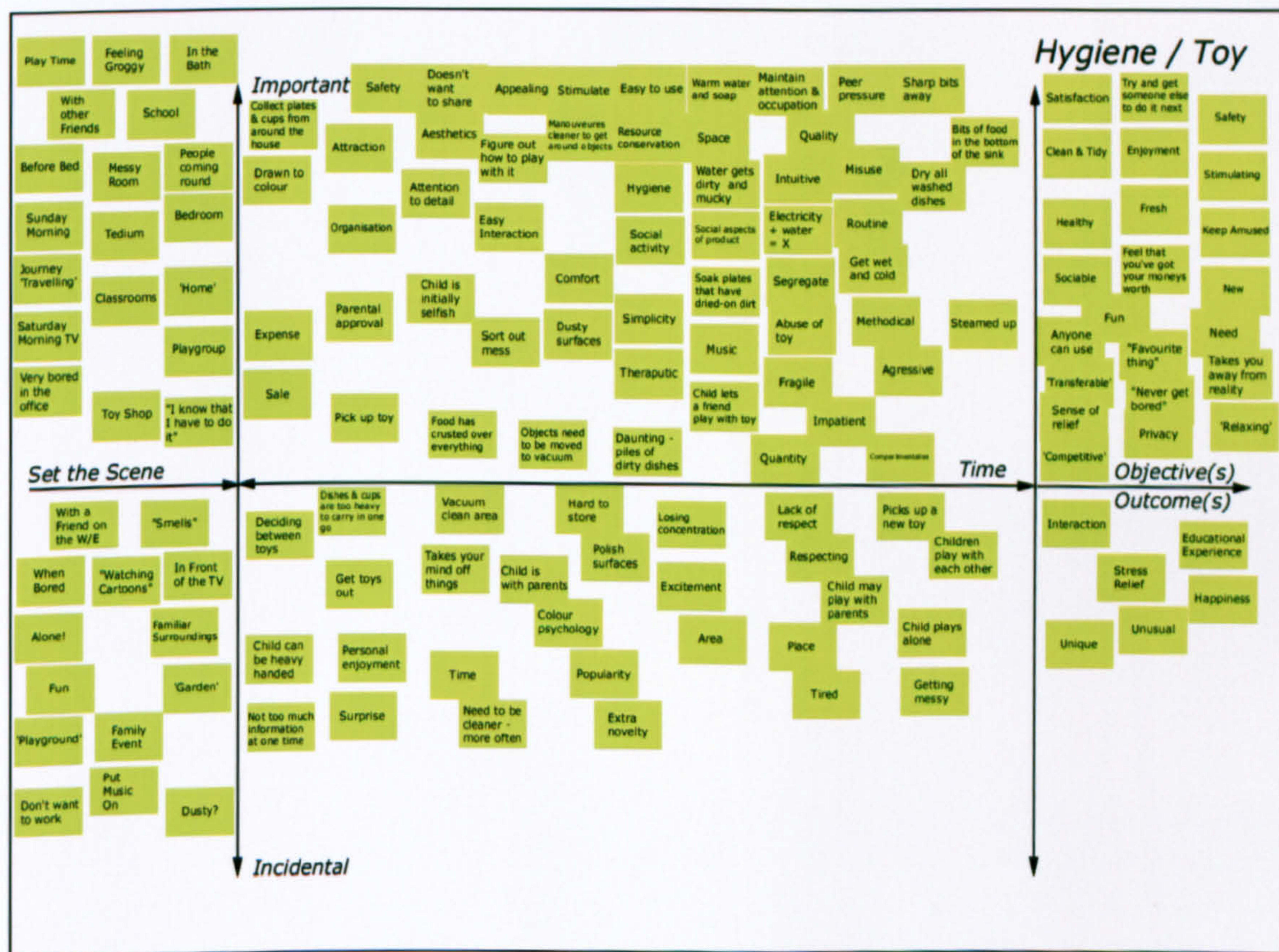


Figure 4.5b: Sample Scenario map (organisation of customer data)



Figure 4.5b: Detail of Sample Scenario map (organisation of customer data)

#### 4.6 Stage 3: Interviews and reflective

These sessions formed the basis for reflection upon specific methods adopted by industrial designers during the exploratory pilot study. This was an important part of obtaining feedback on processes and methods used, and how they differ from everyday industrial design practise.

##### 4.6.1 Designer Interviews

A series of interviews were used to support and underpin the projects set in the exploratory pilot study. These interviews were designed to better understand the nuances of industrial design processes and glean information as to how 'customer understanding' is used in the early stages of an industrial design process, and the details of how it stimulates and drives ideation processes.

These sessions provided greater detail as to the nature of customer understanding and it's involvement in the early stages of industrial design practise.

#### 4.7 Stage 4: Design Brief

'Customer understanding ' was used to generate design briefs for design responses. However for this process, Schon's (1987) theory of reflective practise was adopted as a simplified model as representative of the actions of the early stages of an industrial design process. This model can be applied as follows:

- Naming - design brief (name the problem)
- Moving - the generation of ideas
- Reflection - relating ideas to the problem
- Frame - the problem or design space

In this exploratory pilot study, the researcher was conscious that design briefs are often framed in terms of products i.e. redesign a kettle. Controlling briefing therefore becomes increasingly important when considering the integration of 'customer understanding' and 'breakthrough innovations'. The Briefing process was therefore an adaptation of Schon's simplified model and provides to industrial designers of the potential to remove product specific constraints and use 'customer understanding to drive the ideation process. (See Figure 4-7). It is important to note at this stage that there are a number of levels of re-framing that could take place, however, for the purposes of this illustration only one level is used for reasons of simplicity and clarity.

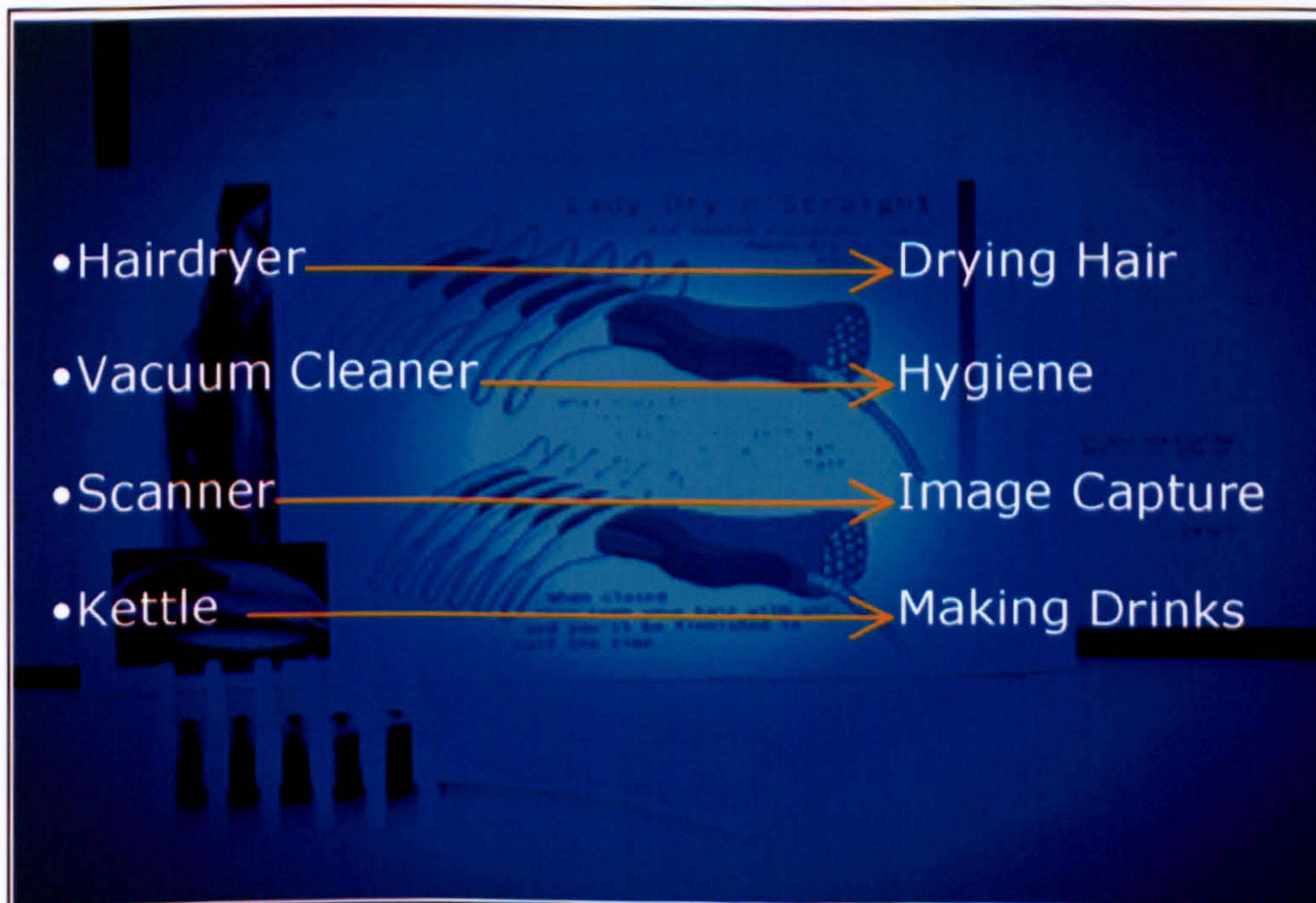


Figure 4-7: Example of re-framing design brief

### 4.7.1 Background to controlled briefing

Briefing was controlled in order to maintain impartiality during the observation of the earliest stages of industrial design practise. Schon's model was presented as a model for creating design space. Further to this model, the researcher imposed one modification to this model and afforded the design participants a design brief set in customer activities rather than product terms. This affords the participants the opportunity to reframe a product specific design brief as it is informed by 'customer understanding'; an Empathic Design approach to driving ideation. It was felt that this would free the design participants to drive at 'breakthrough' innovations.

### 4.8 Stage 5: Idea Generation and concept Development

During this stage, the design brief as defined by the industrial design participants, together with the results of the research phase would be developed into product ideas and new concepts. This would be conducted entirely by the Industrial Design Students from the university of Hertfordshire with controlled support and input from the researcher. A number of key developments and observations took place during this process.



### 4.8.1 The Scenario Maps

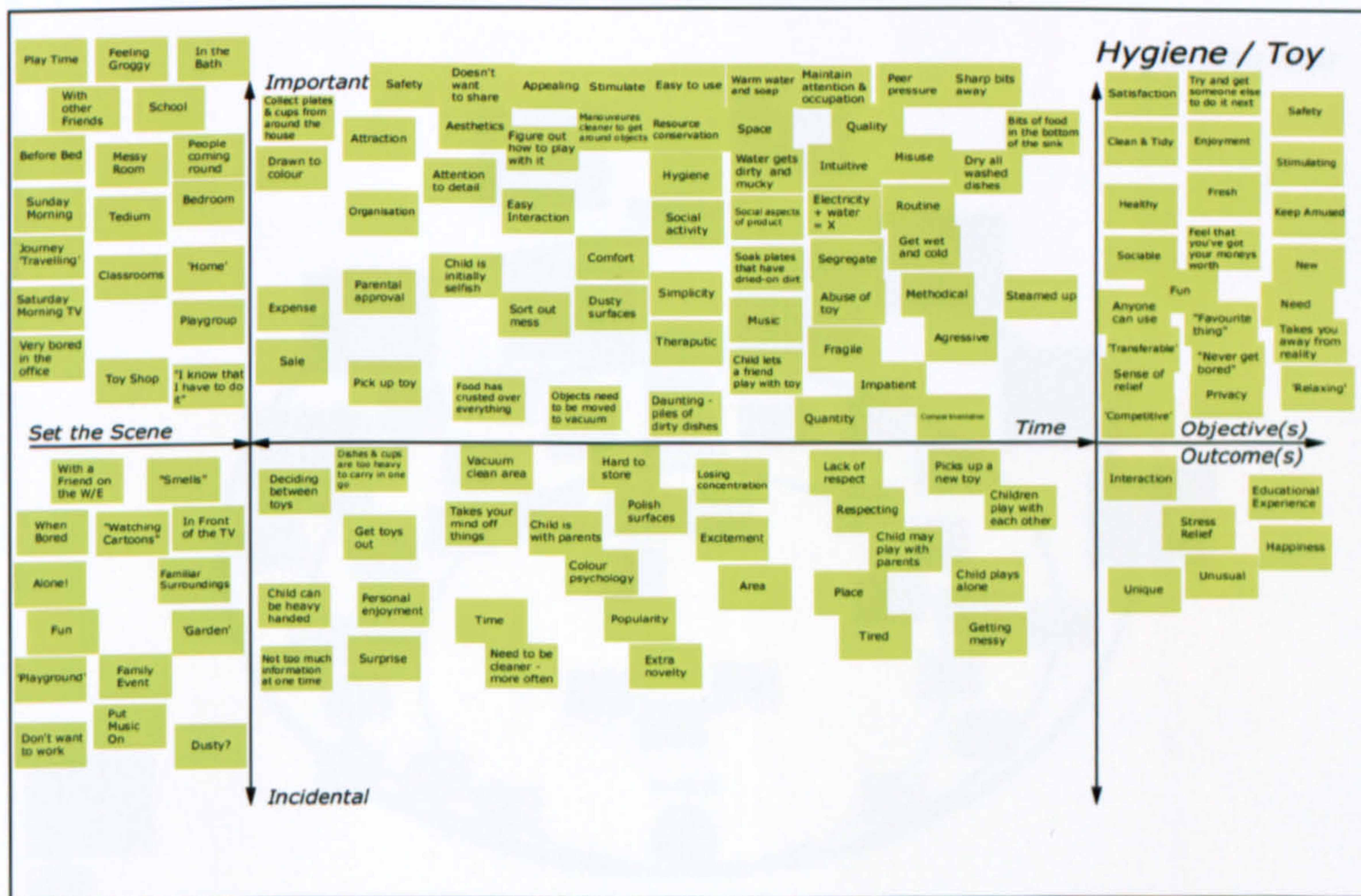


Figure 4-8a: Sample Scenario map (organisation of customer data)

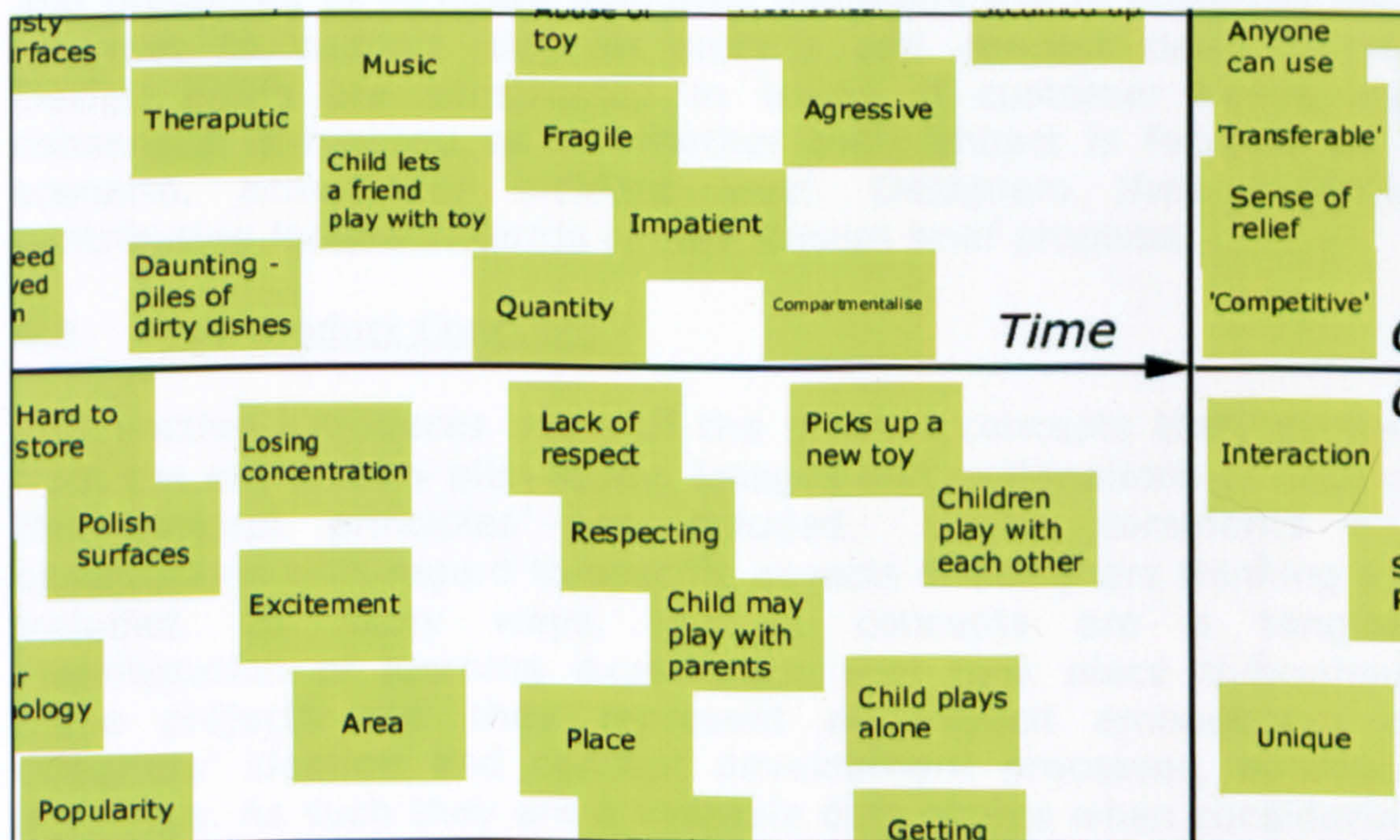


Figure 4-8b: Detail of Sample Scenario map (organisation of customer data)

## 4.8.2 Delivery Maps

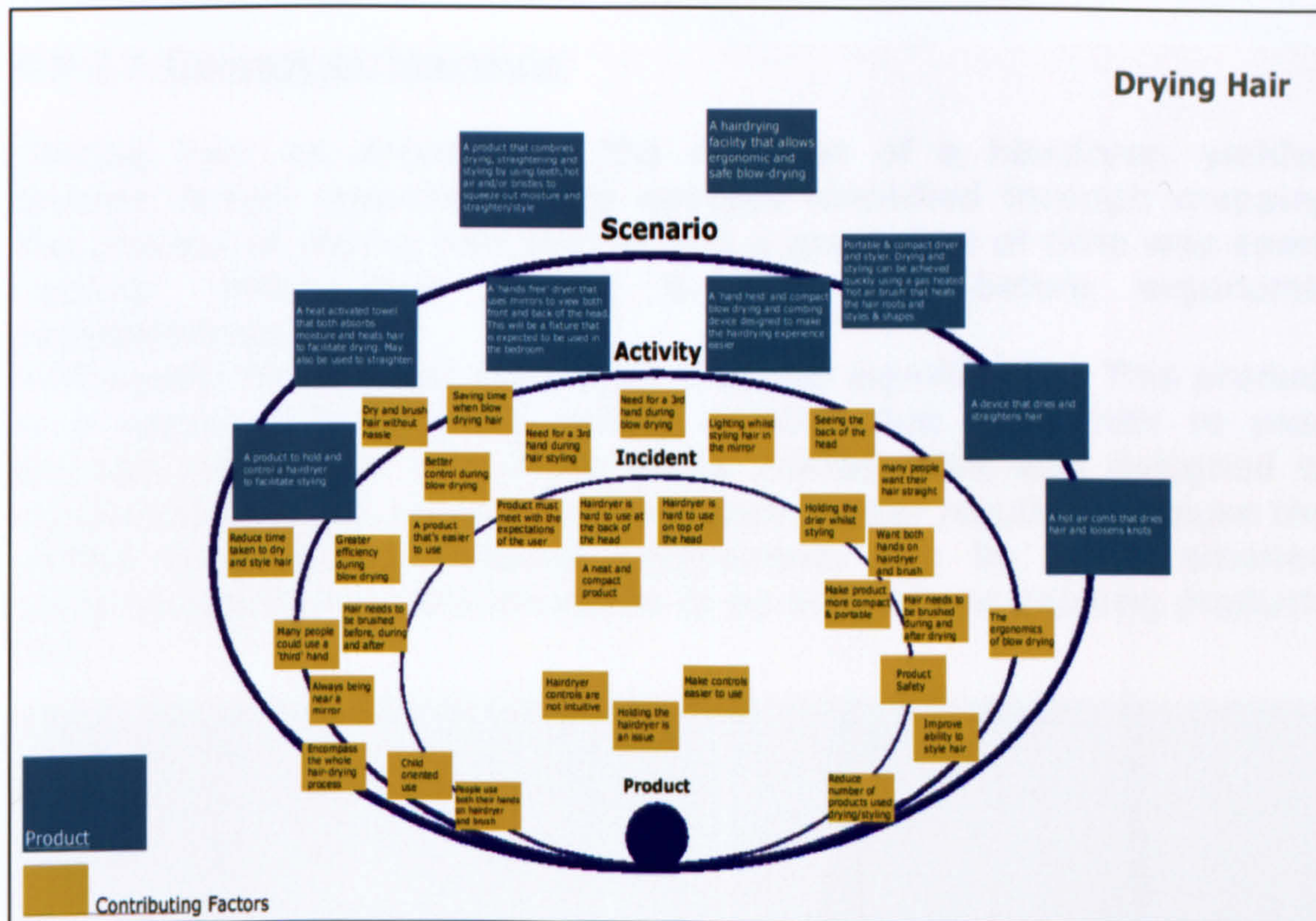


Figure 4-8: Delivery map for drying hair. These maps were designed and presented to facilitate industrial designers use of customer data in order to support ideation process and concept development. Design briefs are constructed in terms of customer needs and consensus is reached as to whether their impact is focused on a scenario, activity or incident level. Designers then organise contributing factors in terms of each design brief proposal.

## 4.9 The product Concepts

This section introduces some of the product concepts that resulted from the exploratory pilot study. Images and explanations of each of the 'concept principles' are included. Some comments and observations with regard to specific aspects of designers thinking are included. In many ways, product concepts are a tangible manifestation of learning experiences that took place throughout these projects and they represent an explicit embodiment of designers' ideation and concept development processes, approach and focus. As such they are a valuable data source when considering the analysis and conclusions. Two sample projects are illustrated below:

#### 4.9.1 Drying Hair:

##### 4.9.1.1 Concept 1: 'Hairstyle'

'Drying hair' as opposed to the redesign of a hairdryer, yielded diverse design responses. This concept identified through mapping the process of drying hair that in fact a great deal of time was spent 'styling' rather than drying it. So even before ergonomic considerations were introduced, the product focus had changed significantly. This product is a series of contracting hollow combs what allow hair to pass through and air to exit along these combs. This was designed to quicken the styling process, and produce 'better results'. Because the airflow is localised, internal components can be much smaller, allowing ergonomic considerations to be met, where existing products fail.



Figure 4-9a 'Hairstyle': a hairstyling concept developed through the exploratory pilot study at the University of Hertfordshire by a level 2 student.

##### Concept 2: 'Hair Masseuse'

This is an interesting concept that highlights a number of issues and responds to an empathic design process in a way that uncovers misuse in an industrial designer. The concept in question is designed to

appeal to a predominantly male audience. 'Customer understanding' processes uncovered a significant male leaning towards hairdressers. Further observations uncovered that hair washing and 'head massage' could be an underlying reason for this. The product was designed to recreate the experience of a head massage at home. This it did, effectively. However, when this concept was presented to its target audience, the response wasn't altogether positive. The underlying reason wasn't accurately uncovered, and as a result of significant customer assumptions during the ideation process the product was misplaced and didn't engender customer delight for intended reasons. However, it is important to recognise that though the design response does not meet the underlying needs of customers the concept has a sound basis for stimulating ideation processes. (See Fig. 4-9b)

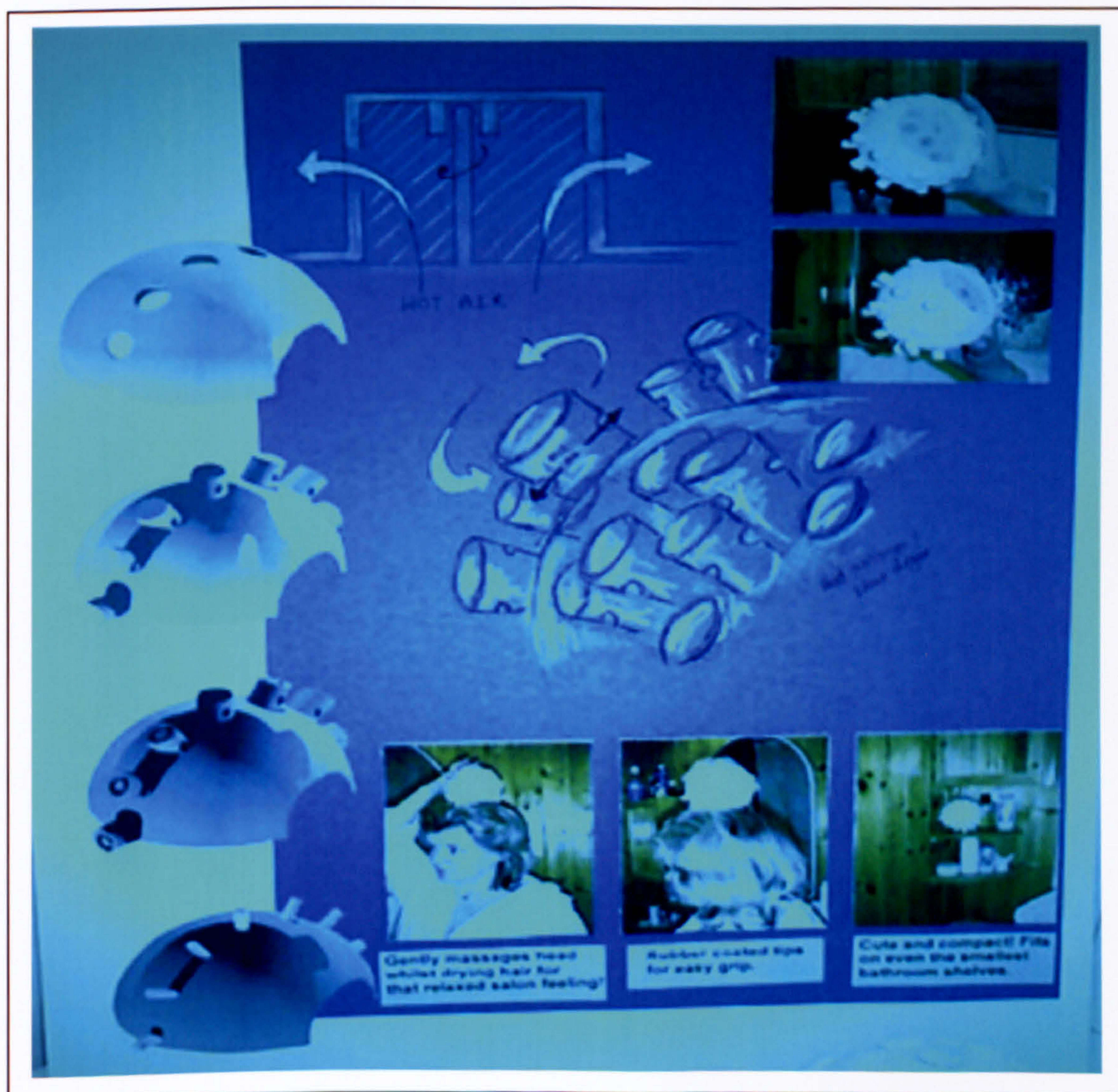


Figure 4-9b - 'Hair massage'

"I saw how many men enjoyed having their hair washed and dried in a hairdressers and observed the positive experiences, I leapt to a conclusion. I assumed that it was the massage action they enjoyed, whereas in fact it was the association with the masseuse or hairdresser that made them smile." (Ids-stu 6)

#### 4.9.2 Boiling water – Hot drinks: 'SMART Office'

The 'SMART' office drinks maker identified, through customer observation and subsequent 'customer understanding' processes and scenario mapping and further investigation into office drinking scenarios.

This product is a series of SMART mugs: one for each office member. This product becomes the centre for office drinks management. These mugs are pre-programmed by each office member to indicate their preferences for drinks. Any given colleague can continue the ritual of 'making drinks' without having to remember individual colleagues preferences. Multiple preferences are set by individual owners, and selected on an individual drink basis.

You (or a colleague) inserts each mug into the drinks station, and the product steam-cleans each mug before making and dispensing the pre-selected preferred drink. Each smart mug has a coaster that identifies which desk or colleague owns it. It was designed to provide a balance between individual preferences and collective efficiency.

"Well, when I looked at the whole process and looked at what was important, it wasn't actually a kettle that caused most problems. The most irritating part of the process, was in fact remembering what everyone wanted, oh yes and cleaning mugs!!" (Ids-Stu 8)

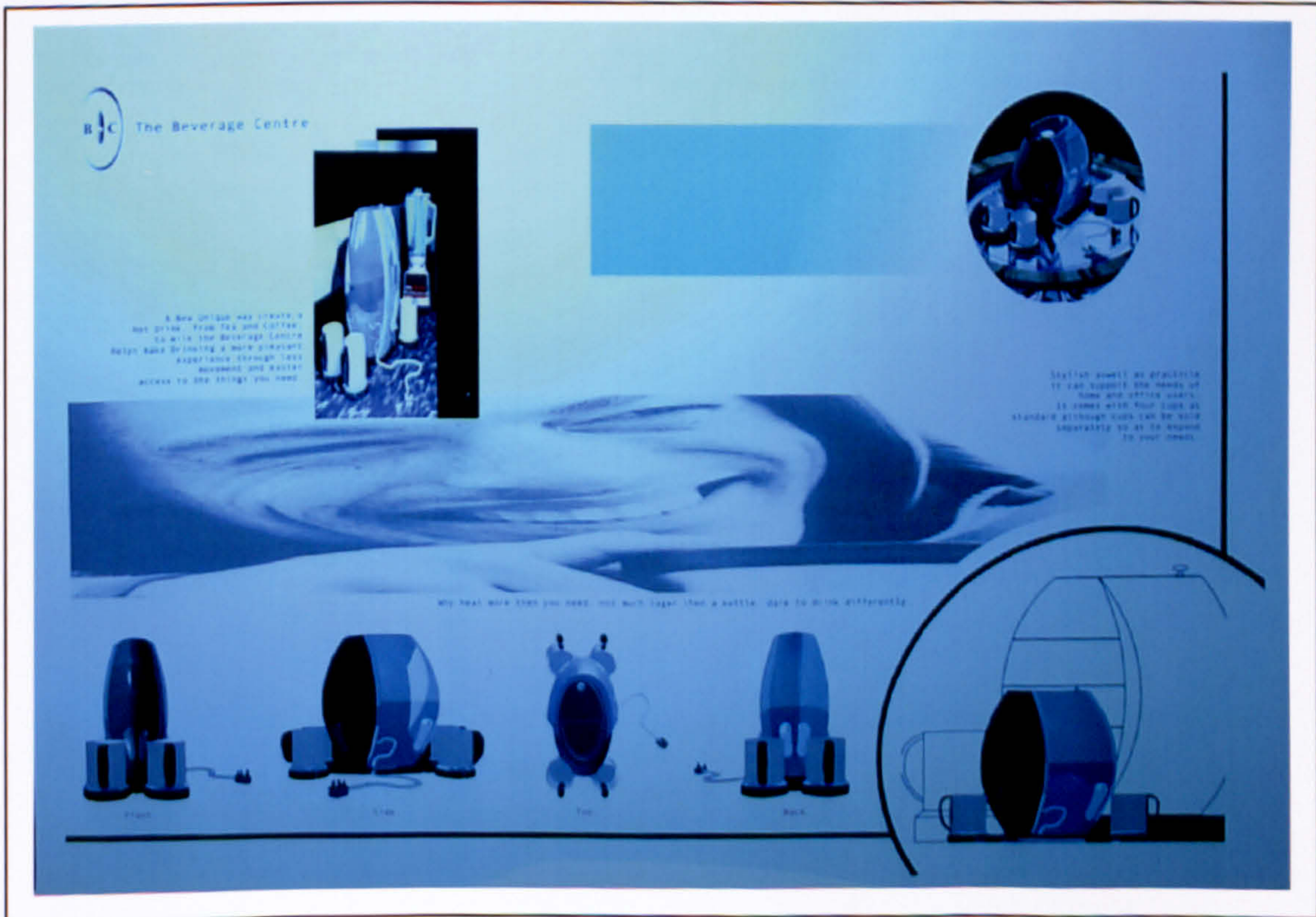
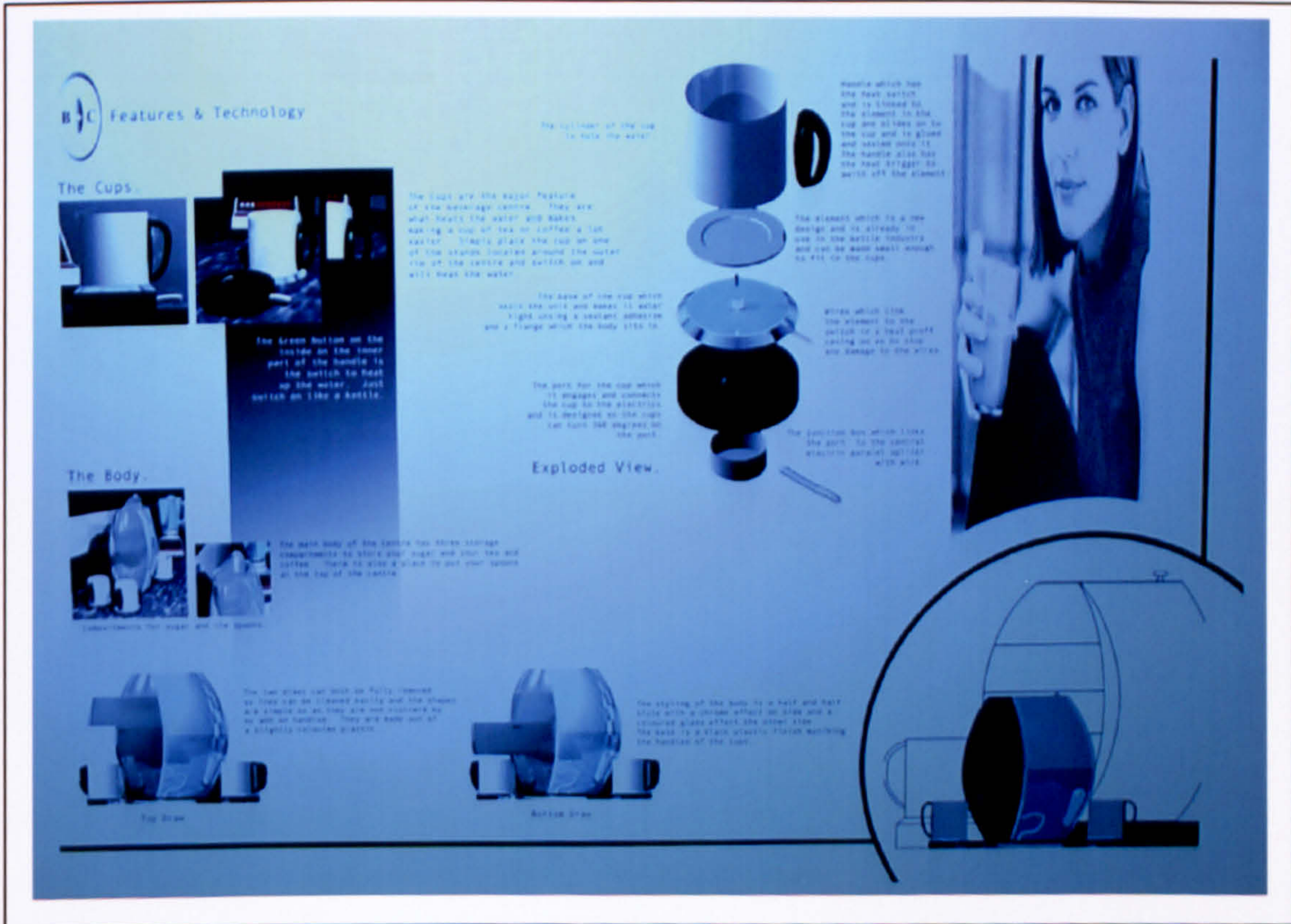


Figure 4-9b - Office coffee machine that knows your preferences

#### 4.9.1 Product Communication

The literature review identified the importance of presenting information in a way that is appropriate to an intended audience. The work carried out during the exploratory pilot study illustrated that industrial designers are presented with customer data that they found to be inappropriate in terms of focus, information, and/or language. Visual stimulus used by industrial designers is often product specific. Examples of inspirational designed artefacts often form the basis for design responses. This is translated through the ideation and concept development processes and extends to the communication of design responses. This could be observed through the adoption of specific empathic design methods. This has also highlighted the propensity amongst industrial designers to rely upon their design responses to communicate the 'value' of their entire concept and the underlying needs they seek to address.

#### 4.10 Data Analysis

This section begins the process of analysing data and drawing initial conclusions from the exploratory pilot study. Available data in the form of interviews, observations, video recordings and notes were supported by direct contact with participants. The researcher also retained access to the representations of specific outputs from aspects of customer understanding and ideation processes as well as the concepts themselves. Data were analysed by coding and clustering in order to extract common themes when considering specific processes and activities. This would guide the data collection and analysis for the main study. These themes were deliberately broad so as to provide initial directions and areas of focus from the exploratory pilot study. Following initial observations further discussions took place with project participants and observers. These took the form of reflective sessions, as well as further semi-structured interviews by the researcher. A number of research themes were identified. This took place after each phase of the exploratory pilot study to facilitate data collection throughout the duration of the exploratory pilot study and provide greater focus for the data collection in the main study.

### 4.11 Coding and clustering the data

The coding consisted of the following conceptual themes used during both data collection and analysis:

- Pro: refers to the ideation processes adopted by industrial designers
- Info: refers to 'customer understanding' stimuli used to drive ideation
- Innov: refers to the 'nature' of innovations proposed as concepts or design responses
- Comm: refers to the communication of 'customer understanding' or concepts and design responses

Each of these clusters contained specific properties and characteristics that were emergent through the exploratory pilot study. Specific comments, observed data and design responses were coded and related to these clusters. Much of these data were initially coded in real-time and formally coded as themes developed. Qualitative data analysis using inductive methods were adopted in order to provide clarity throughout the analysis. (Glaser and Strauss, 1967). This flexibility allows for the emergence of new themes (clusters) throughout the processes of collecting and analysing data. This also affords existing themes the flexibility to expand, merge and focus. The resultant conclusions are therefore grounded in reality (Miles and Huberman, 1984). In this case these are not conclusions but hypotheses derived from initial findings. The following section describes the key findings of the main pilot study, through to the development of hypotheses to be used in the main study.

### 4.12 Key Findings

The provision of inspiration and stimulation is closely linked with the ideation process. It encourages the creative practise of new stimuli to facilitate problem solving (Allan et al., 1999).

### 4.13 Emergent findings from the Exploratory Pilot Study

- Artefact driven stimuli during ideation processes: Across all connected projects during the exploratory pilot study, industrial designers exhibited a 'natural tendency' to be driven by inspirational artefacts when actively participating in either 'ideation' or 'concept development' practices. This was articulated by participants as being appropriate language for and also in relation to the required response. I.e. inspiration



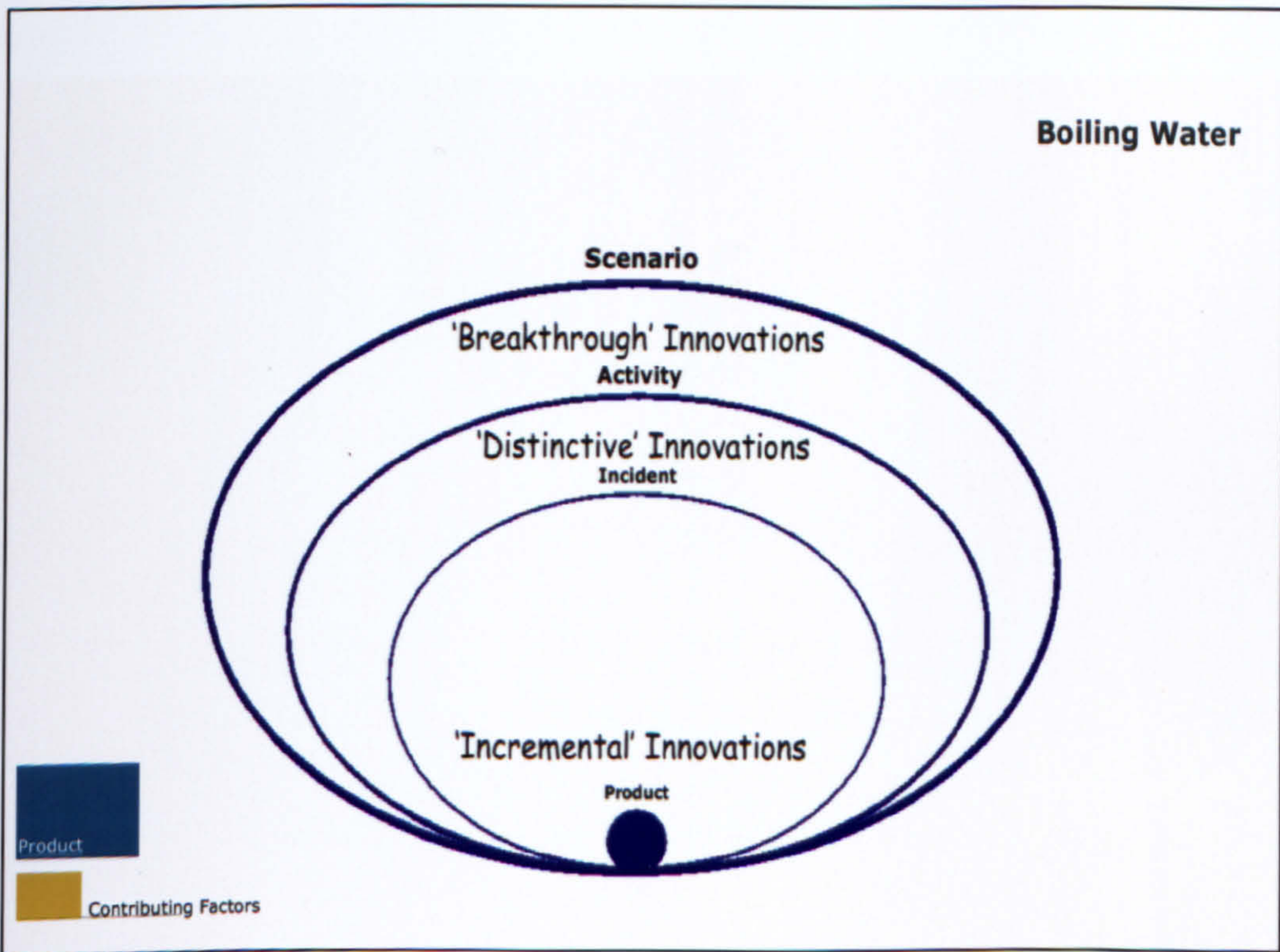
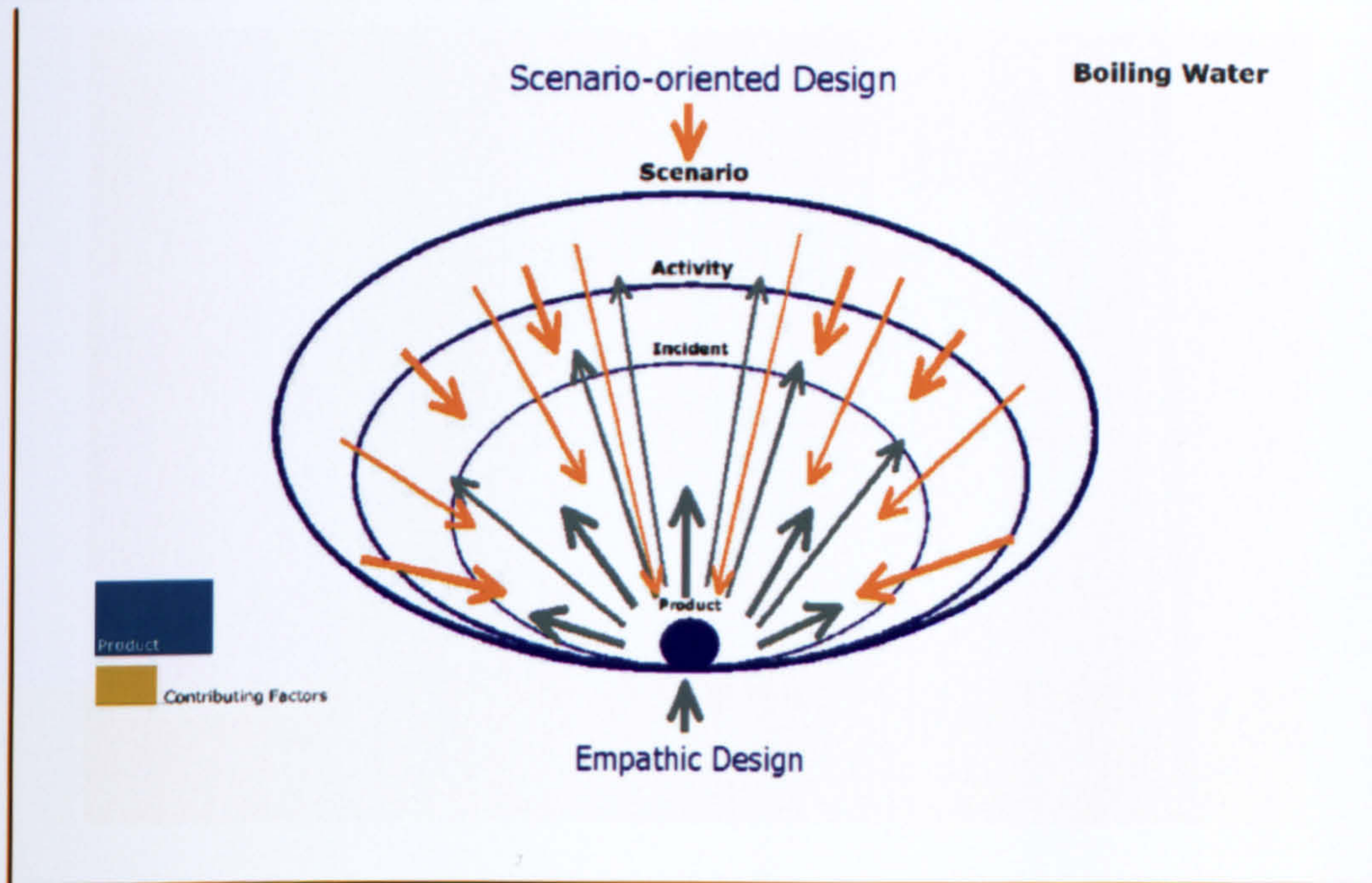


Figure 4-13: levels of innovation to 'Customer Understanding'

Figure 4-13 Illustrates the observed change from a product to scenario start point and the direction of the design focus. It also illustrates the relationship between 'breakthrough' innovations and customer scenarios.

- Organisation of customer data:  
There are no explicit methods or processes presented within Empathic Design for organising customer data. Critically, customer data remains product specific and begin with products as an initial point of focus. 'Customer understanding' is already constrained by products and so could be limited by existing customer paradigms. Organising customer data in terms of scenarios and activities could provide opportunities for 'breakthrough innovations' and greater understanding of the impact upon customer activities of these 'breakthrough innovations'. This has been observed through the identification of underlying need when considering scenarios rather than products. However, it was articulated during the exploratory pilot study that: "We can't see the product... we can see what's wrong with peoples' activities, but there's no way of deriving a product without guessing". (See Figure 4-13b)

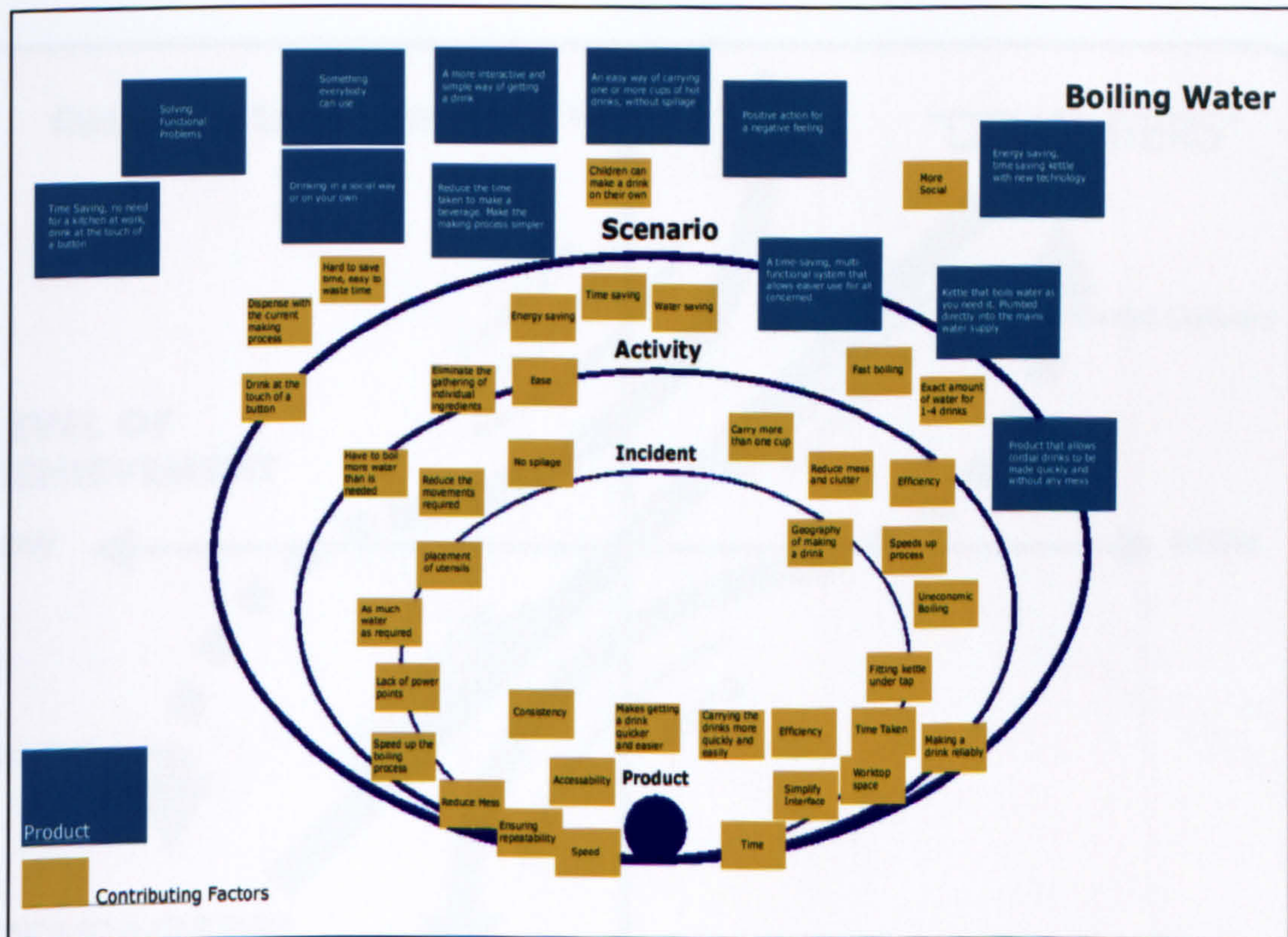


Figure 4-13b: Diversity Map (Barrett, 2000)

Figure 4-13b illustrates the reframed design briefs in relation to their effect on customer paradigms: scenarios, activities and incidents. It also illustrates clusters of individual product qualities in relation to these design briefs.

- The link between the Kano Model of Customer Satisfaction and levels of innovation (products as catalysts):

The design concepts generated during the exploratory pilot study exhibited significant connections to the modified Kano model of customer delight. Radical innovations (defined as those deemed to engender changes in customer behaviour) can deliver the unexpected through the delivery of basic qualities if these qualities are reframed in terms of customer activities rather than specific products. If the Kano model highlights the unexpected as a driver for delight, then engendering a positive change in customer behaviour through the redefinition of a given customer experience may in fact deliver basic qualities to an exceptional standard and provide opportunities to delight customers. Burns' (2000) modification of the Kano model supports the notion that the exceptional delivery of basic qualities can achieve customer delight (See Figure 4-13c)

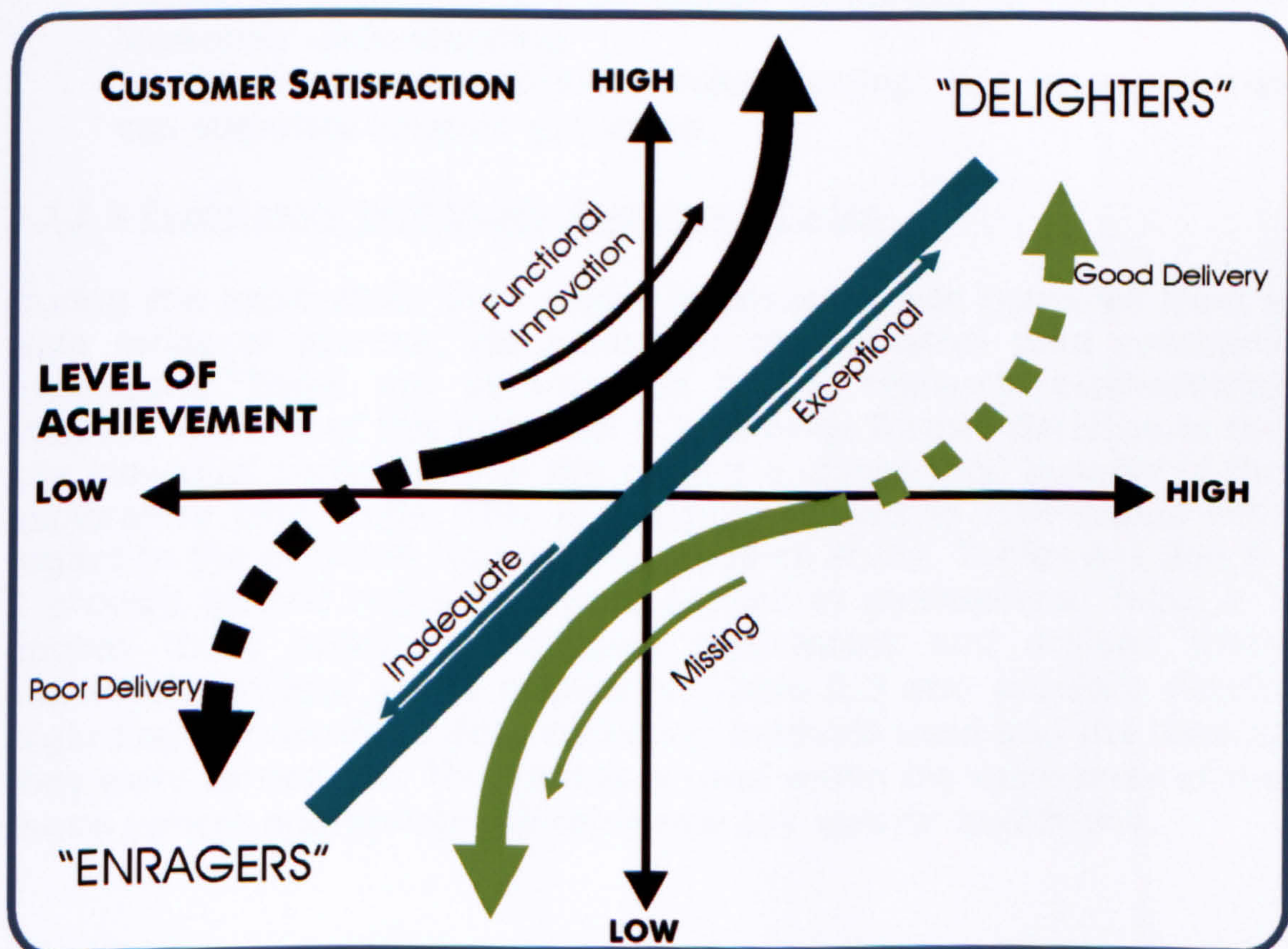


Figure 4-13c: Modified Kano model (Burns et al., 2000)

Figure 4-13c illustrates a modification to the Kano model of customer satisfaction. This modification illustrates that innovations that have a low level of achievement have the propensity to enrage customers,

whilst it also shows that exceptional achievement of basic qualities have the propensity to delight customers.

#### 4.13.2 Summary of Pilot Conclusions

The exploratory pilot study highlighted a number of key findings that are specific to the use of 'customer understanding' in the earliest stages of an industrial design process and the drive for innovation based on 'customer understanding':

- 'Breakthrough' innovations can come from uncovering the latent and tacit underlying needs of customers scenarios.
- Empathic Design in its current guise has a product specific entry point.
- Reframing the design brief removes product specific constraints
- Industrial designers require an explicit link between 'customer understanding' and ideation processes
- Industrial designers rely on design responses to communicate 'customer understanding'
- Designers require 'customer understanding' in a language that can stimulate ideation processes.

#### 4.13.3 Exploratory Pilot Study Participant Codes

During the exploratory pilot study, information was gathered from a wide range of sources, via a number of qualitative data collection techniques. These are summarised in the research methodology chapter. The aim of this appendix is to provide further detail as to the key individual participants in the project and interview aspects of the exploratory pilot study. This is designed to extend clarification with regard to the evidence trail for this research study. Tables A-1 and A-2 provide generic codes that were applied to participants. Table A-3 applies these codes to individual participants and assigns them individual numbers where necessary. Table A-3 also provides details regarding the nature of data collection methods used and the date(s) they were carried out. This coding is used within the main body of the thesis (where appropriate) to reference any specific quotations.

Nissan Senior Design Engineer	Nis-sde
Nissan Design Engineer	Nis-des
MIRA Researcher	Mir-res
Design Council UK Essential Customer Intimacy Participant	Des-eci
NOP Automotive Director of Research	Nop-dor
University of Hertfordshire Product Design Programme Staff	Uh-pdl
University of Hertfordshire Product Design Programme Student	Uh-pds

Table A-1 Coding for project and case participants - exploratory pilot study

Industrial Design consultancies in UK	Ids-con
Industrial Design Education specialist in UK	Ids-edu
NOP Automotive Director of Research	Mrs-nop
Advanced Product Group - Ford	Apg-frd
Industrial Designer - In house, UK	Ids-inh

Table A-2 Coding for qualitative interview participants - exploratory pilot study

#### 4.14 Theoretical Development

The implications of these findings are incorporated into a development of the Kano model (Figure 4-13c). The exploratory pilot study has not employed Kano's positivist methodology. The model represents new understanding gained by investigating the ideation of 'disruptive' or 'breakthrough' innovations highlighted in the literature review. This is purely a theoretical development of the Kano model. This development includes an additional route to extended customer satisfaction or customer delight (represented in the upper right quadrant of the model). This is the exceptional delivery of basic or expected attributes when considering the latent and tacit real needs of customers activities, rather than products, or specific product interactions. Kano's unexpected answers to latent and tacit needs of customers, 'attractive' and scalar 'linear' routes to delight through specific product delivery have not been explored during this pilot study.

Further implications of these findings are incorporated into the Empathic Design process when considering the development of an additional route to customer delight. Though the understanding of the latent and tacit needs of customers remains at the foundation of Empathic Design, the opportunities for radical innovation; attractive qualities, usually represented as functional innovations, can also be explored by the exceptional delivery of 'basic' qualities when considered on an activity or scenario level.

Empathic Design, together with the culture of industrial design and the Kano model itself are driven by products. And each begins with a product as its starting point. Leading industrial practitioners and those adopting similar approaches to Empathic Design, begin with a product-specific initial point of focus. This continues through their exploratory design research and initial design processes that begin and end with products. The development of Empathic Design that has been operationalised during the exploratory pilot study represents new understanding gained by investigating the practice of an Empathic Design methodology.

### 4.11 Development of Hypotheses

Within this section, hypotheses are drawn out of the research questions based on the empirical findings that have emerged from the exploratory pilot study:

- Reframing the design brief and understanding and organising 'customer understanding' in terms of activities contributes to driving ideation processes towards 'breakthrough innovations'
- Communication shift: Shifting the emphasis from artefact to concept during ideation processes affects the level of impact on customers: Organising stimulus in terms of customers for ideation and concept development facilitates the drive for 'breakthrough' innovations
- 'Empathic Design' methodology needs to be designed to integrate naturally into daily practise of ideation and concept development (early stages of industrial Design) to complement industrial designers dynamic way of working
- Understanding the connection between underlying needs and 'Ideation' facilitates 'customer understanding' as drivers for design responses

#### 4.14 Summary

Four hypotheses have emerged as a result of the empirical data collected during the exploratory pilot study.

The next chapter presents the final format for a prototype 'Empathic Design' methodology that embodies the findings of the exploratory pilot study and is designed as a mechanism for testing the hypotheses generated in through the exploratory pilot study. Chapter 6 then tests the hypotheses generated in this chapter using the feedback obtained from the prototype 'Empathic Design' methodology during the main study. Here we will find out if they hold true in reality.

## **5: The Prototype Empathic Design Methodology: Customer Driven Ideation**

### **5.1 The Design of the Prototype Methodology**

This chapter the design and development of the prototype 'Empathic Design' methodology, which was developed using the previously identified characteristics of customer focused ideation identified in the exploratory pilot study.

During the development process, experimental methods (presented and constructed in Powerpoint and Corel Draw) were given to a select group of professional industrial designers and Industrial Design students and reflective sessions organised to obtain feedback. Initial prototype tools were presented as development methods (in concept form) in order to actively encourage Industrial designers' to critically appraise specific aspects and offer informed opinions relating to use and impact on design practise. (Allan et al., 1999)

The prototype methodology was quickly referenced and adopted as 'Empathic Design' - Industrial design research methods, despite key developments. For ease of presentation, and consistency of communication it was considered appropriate by the researcher to continue to adopt 'Empathic Design' as an identifiable title for the continued development of this methodological prototype. 'Empathic Design', even as a notion was largely unfamiliar to professional industrial designers, and so would not be confused with the original methods proposed by Leonard and Rayport, (1997).

### **5.2 Presenting an 'Empathic Design' Methodology**

In light of the findings that emerged during the exploratory pilot study the researcher chose to present this prototype methodology as a suite of methods designed to relate to specific aspects of an industrial designer's ideation and concept development processes. This suite of tools was presented as an intuitive guide rather than as a prescriptive manual in order for participants to further reflect upon the nuances of 'Empathic Design' practice. This suite of methods was designed to create a customer-focused ethos to guide industrial designers through the earliest stages of their ideation process. Information design literature was consulted during this process (in order to consider industrial design learning styles and nuances of industrial design practice already highlighted) in the design of the prototype methodology. (Ota et al., 1999) identifies that, "well designed information material will satisfy aesthetic,



economic, ergonomic, as well as subject matter requirements.” The guide presented to Industrial Designers clearly aligns with the practice of industrial design and integrates with specific aspects of an industrial design process. It has been constructed to deliberately intervene with these aspects.

### 5.2.1 The ‘Empathic Design’ Prototype Methods

The following Empathic Design methods were presented to the industrial design participants:

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## Empathic Design Tools #9



### Re-frame design brief

Re-framing the brief is a brainstorming activity that involves designers giving them the opportunity to remove product-specific constraints from their customer investigation & initial idea generation process. It encourages designers to focus on scenarios & situations before product interactions (e.g. look at the act of creating a document, before focusing on mouse use). Re-framing can create a broader design space, allowing you to develop solutions that have the greatest impact on peoples lives & behaviour.

### Use Re-framing the design brief to...


- Provide the opportunity to maximise your impact on customer activities.
- Remove the product specific constraints on the design space.
- Allow the designer to take at least one step back to enable broader avenues of investigation.
- Increase the design space, providing greater opportunities to innovate.
- Increase the potential for diversity of ideas.
- Help you understand customer activity oriented problems.
- Help you shift from product specific to customer oriented solutions.

Re-frame design brief

Figure 5-2A: Fe-frame Design Brief Tool

Figure 5-2A illustrates the 'Reframing Design Brief' tool. This tool, as with others in this section have now been published in 'The Empathic Design Tutor', (Evans, Burns & Barrett, 2002). This illustration is of the introduction to the method and highlights why it would be used and what it is designed to achieve.

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**Empathic Design Tools #1**



**Product-in-use**

Product-in-use employs multi-disciplinary teams of designers as researchers & uses video equipment to capture people's behaviour in real life contexts. The aim is to collect a rich account of the behaviour surrounding a product or activity, in a format that is stimulating & allows the insights gained to be easily shared & reflected upon. By observing behaviour in-context it is possible to identify the problems in life that people have become accustomed to. Product-in-use allows the identification of opportunities to innovate by recognising problems people are solving or working around themselves, by saving them time, by reducing dangerous behaviour, by limiting wasteful behaviour, or by influencing the social & emotional context of behaviour.

**Use Product-in-use to...**

- Capture the in-context behaviour that people don't normally report.
- Learn what people actually do rather than what they tell you they do.
- Identify strategies & behaviours used by people to get around problems.
- Uncover how your product is really used rather than how you designed it to be used.
- Increase your understanding at different levels; i.e. at the level of products, activities, or at the level of the entire scenario/process.

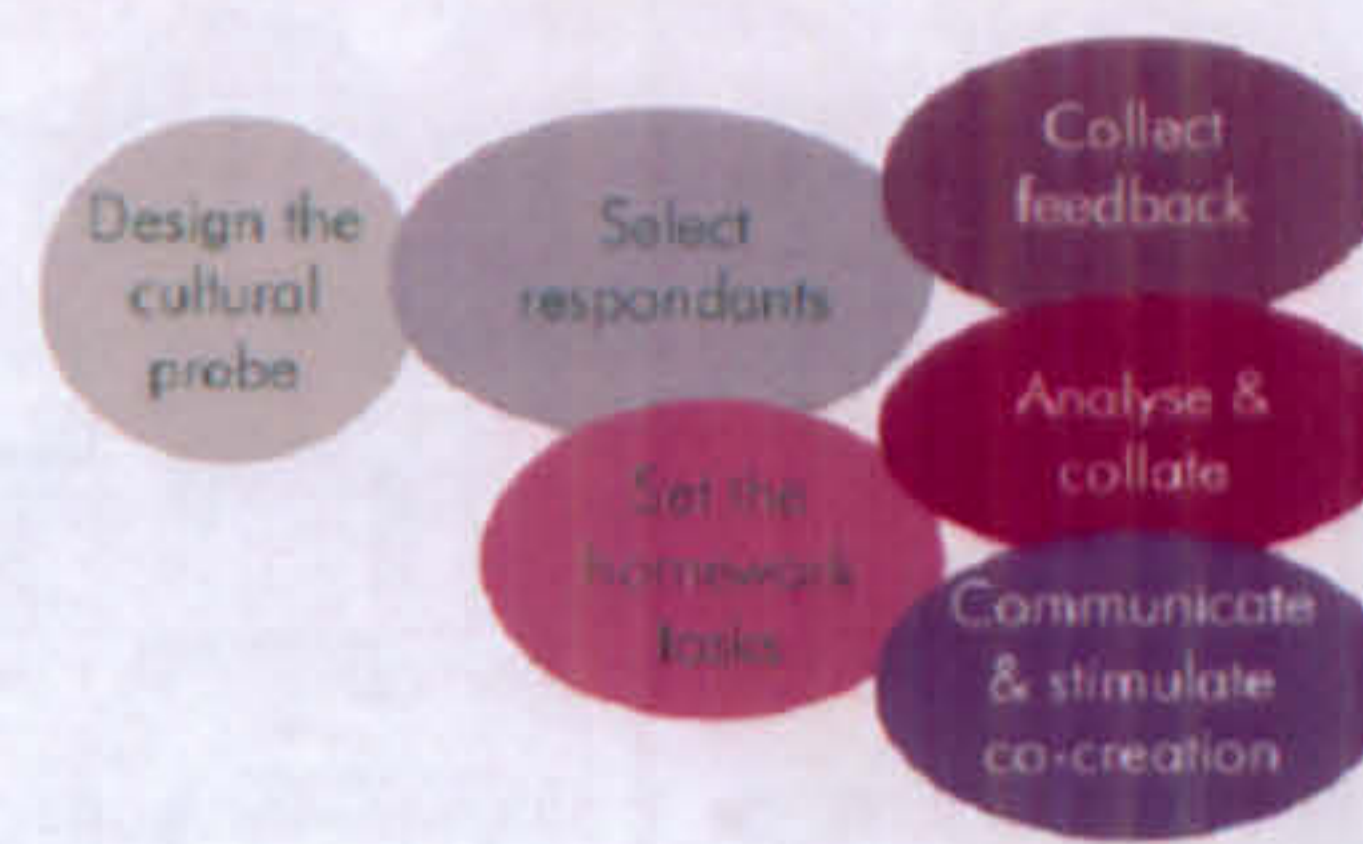
Product-in-use

Figure 5-2B – 'Product in Use Tool'

Figure 5-2 illustrates the introduction to the 'Product in Use' tool. This introduced the participants to methods of direct customer observation. It specifically highlights cues for designers to access the tool at on 'incident' 'activity' or 'scenario' levels. That is observation focused on product interactions, customer activities, or entire situations. Using this tool provides designers with access to cues and prompts throughout their implementation of this tool. Key development from the original Empathic Design proposal of direct observation is the prompted relationship between the observations and other activities and the questions, cues and prompts are no longer product specific.

### Fun camera

The fun camera is an example of a cultural probe. This type of tool gets people to do their own research by giving them engaging homework tasks. Using a variety of techniques, including drawing, postcard writing, map making & disposable cameras, people are encouraged to record & interpret their own experiences. Taking the example of the fun camera, people are provided with single-use cameras & asked to photograph activities, products & contexts. This is invaluable in situations where researchers find it difficult to observe customers first hand. It can also provide access to real customer experiences in true context, capturing frustrations, delights, anxiety, joy & other customer experiences as they happen. Using a visual means of capturing data, coupled with diary entries can often help provide insights into the experiences people find difficult to put into words alone. This approach helps people to interpret their experiences and define their contexts. Importantly, this happens in real time & does not require the memory triggers or cues needed by researcher-led inquiries such as questionnaires.



#### What do you get out of it?

- Access to behaviours & experiences that aren't readily available.
- Customer's interpretation of their own needs.
- Responses to real-life experiences as they happen.
- Customer visualisations of their experiences.
- Stimulus for idea generation.
- Stimulating data that's easy to communicate - it speaks for itself.

Figure 5-2C: 'Cultural Probe' Tool

Figure 5-2C illustrates the introduction and guide for the cultural probe (Here termed 'Fun Camera'). It illustrates a proposal for gathering observational data in the absence of the industrial designer. This illustration represents the initial introduction and an example guide. It suggests methods for facilitating self-observation by customers and methods for recording that data in real time to 'Capture the Moment' (Ids-Con-2). This illustration also represents the reasons for adopting a cultural probe, along with what participants are likely to get out of it in terms of data responses from customers (not what designers will personally achieve from using this tool).



### Co-creation

Co-creation is a workshop activity which brings your design team together with multiple stakeholders. This can include people with specific expertise across sectors (such as environmental affairs, human-machine interface, materials development), customers, journalists, sales people, extreme users & engineers. The goal of the workshop is the creation of product ideas which result from the participants' consideration of various forms of stimulus, including; role plays, physical objects, still photography, video footage & customer verbatim.



#### Use Co-creation...

- To capture ideas from different perspectives.
- To capture extreme & diverse ideas.
- To tap into the experience & expertise held in other industries.
- In order to involve multiple stakeholders in the design process.
- To challenge the assumptions of your design team.




Figure 5-2D: Introduction to 'Co-Creation' Tool

Figure 5-2D illustrates the brief guide to the 'Co-Creation' workshop. This briefly outlines to potential industrial designers or design teams, the functions of the workshop and what it is designed to achieve. As with other tools, a guide together with case examples are given so that these are not given as 'out of the box' prescriptive tools.

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Empathic Design Tools #2





### Scenario-of-use workshop

A workshop that brings together designers & the people they are designing for. The aim is to uncover previously unvoiced needs using a role-play as an involving cue for recall. The success of the workshop lies in the real-time interaction between the people with the needs & the designers that recognise the possibilities.

**Use a Scenario-of-use workshop...**



- To identify latent & unvoiced consumer needs, wants & desires.
- When you have started to make assumptions about how your customers behave.
- When you want to surprise your customers with features they will not expect.
- If you find yourselves following competitors rather than innovating.
- When you know who the target customer is but not how they think, feel & behave.
- Early in the design process before you have made any decisions that limit the possibilities.

Scenario-of-use

Figure 5-2E: Introduction to 'Scenario of Use' Workshop

Figure 5-2E illustrates the brief and guide for the 'Scenario of Use' Workshop described in Chapter 4. It provides a simple guide and set of rules for potential practitioners and participants. It also demonstrates key examples for the benefit of first time users.

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Empathic Design Tools #10

### Scenario mapping

Scenario mapping is an activity that pools, organises & visualises the inter-relationships between sets of activities & moments of product interaction that we will call incidents. This helps you to consider products as catalysts rather than ends in themselves.

The combined output of this exercise leaves the design team with an understanding of customer activities, the relationship between those activities & the needs associated with them. The design team can then cluster needs & have the opportunity to deliver solutions that can affect activities as well as product interactions.

**Use scenario mapping to...**

- Develop a focus for customer investigation
- Actively remove product from initial customer understanding
- Contextualise customer activities
- Formalise relationships between activities and incidents
- Develop a coherent map upon which product delivery attributes can be based
- Uncover pathways to greater customer impact.

Scenario mapping

Figure 5-2F: Introduction to 'Scenario Mapping' tool

### 5.2.2 Method Aspects

The 'Empathic Design' methodology supports industrial design practice along two distinct streams. Each supports the designers' quest for ideas, but critically one stream supports the drive for deeper customer understanding, and the other affords industrial designers opportunities to innovate upon the basis of that customer understanding. Both these streams support the organic and intuitive nature of industrial design practise in that they are not prescriptive more guides to service specific aspects of the earliest stages of product development. That is from the formulation of design briefs up to the development of conceptual design solutions or innovations.

Stream 1: Facilitates the uncovering of latent and tacit needs of customers as drivers for innovation

Stream 2: facilitates the use and organisation of this information as drivers for innovation. (See figure 5-2)

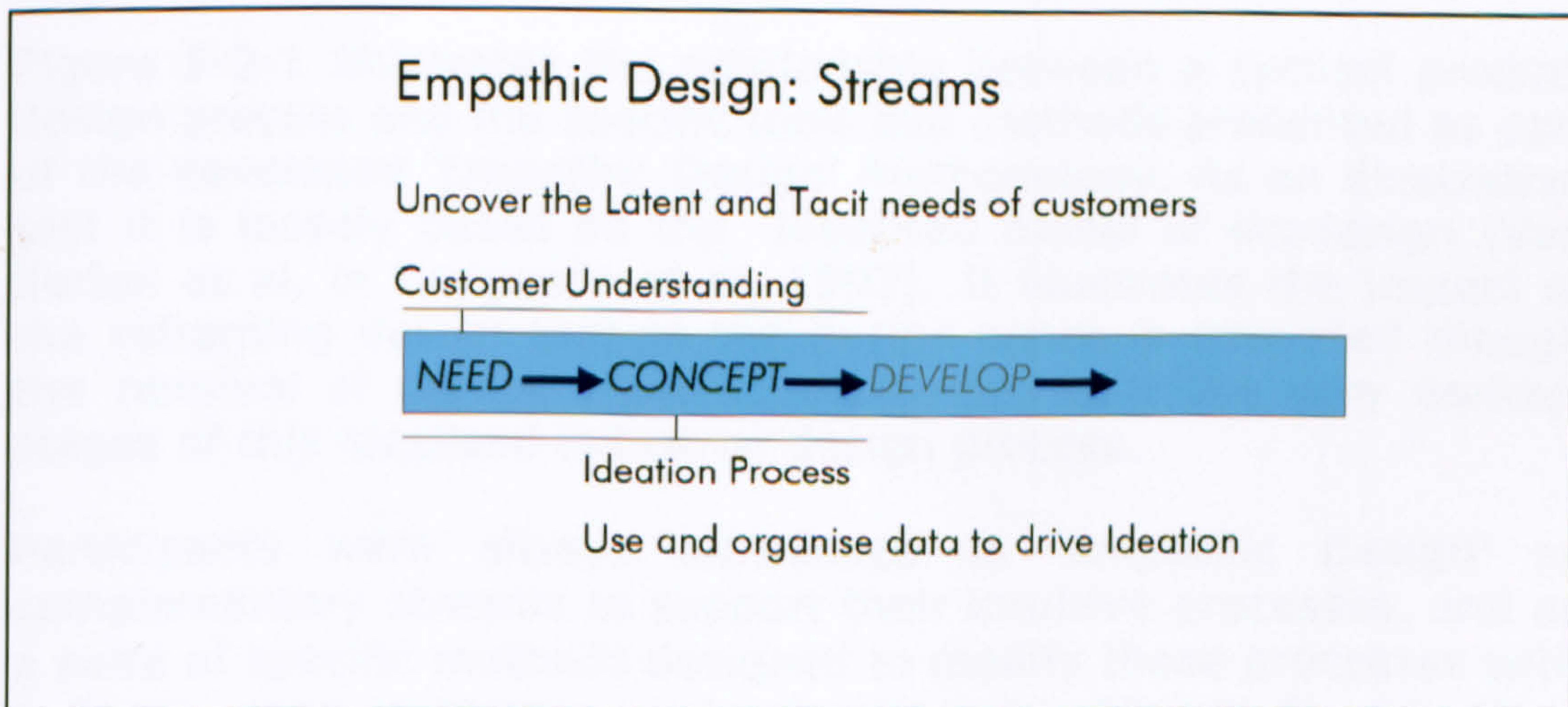


Figure 5-2: The two streams of the 'Empathic Design' Methodology

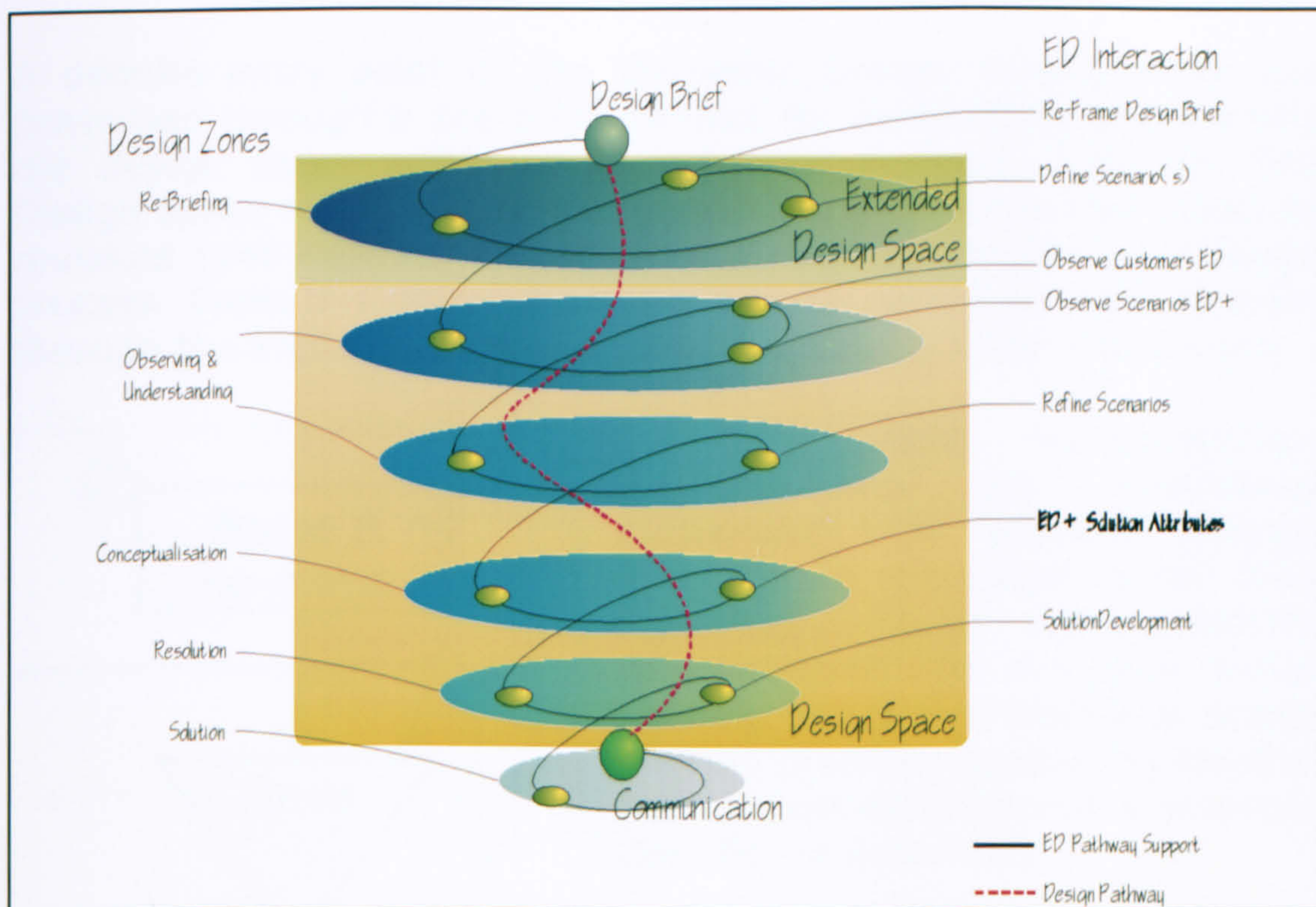
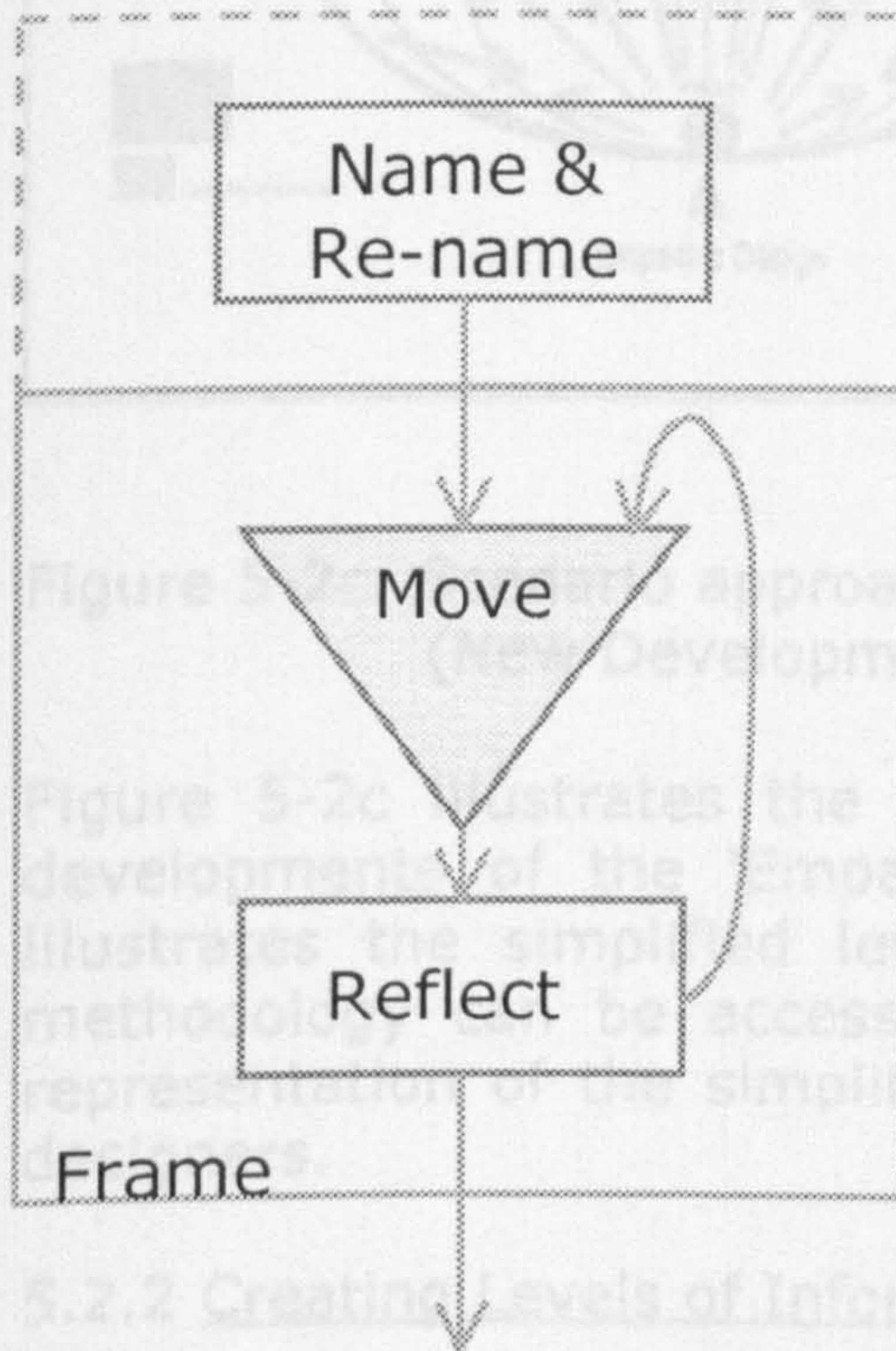


Figure 5-2-1: Design Space model (Barrett, 2002)

Figure 5-2-1 Illustrates the relationship between a cyclical product design process and the specific tools and methods presented as part of the developed 'Empathic Design' methodology. As an illustrative tool it is loosely based on the Idealised model of ecodesign (Van Berkel et al, in Hodgeson et al, 1997). It illustrates the impact of the reframing design tool as the design space is extended though the removal of product specific inferences from the very earliest stages of this idealised industrial design process.

Participants were always introduced to 'Empathic Design' as complementary streams to support their intuitive processes, and as a suite of specific methods designed to modify those processes with a focus upon customer understanding as drivers for ideation. Customers are presented as a cast to drive and support design directions. Methods are proposed sequentially in relation to stages of an industrial design process. Critical findings from the exploratory pilot study informed the management of these two streams. These findings highlighted the disparity between customer understanding and product ideation processes within industrial design processes. This developed 'Empathic Design' prototype methodology uniquely synthesises these two streams and engenders a behaviour change through industrial designers naturalistic ideation processes that connects concept ideation directly to intimate customer understanding.

A definite entry point to the 'Empathic Design' methodology was presented through a pre-brief method for formulating and framing the design space within which industrial designers operate. This Design space remains open throughout the process so that it can be revisited (and defined) at any point during the ideation and design process. From this point, designers can be guided by both streams through the implementation of specific methods. Clear visual cues,



Consistent visual representations and themes are maintained throughout both streams, though their use is suggested rather than prescribed. These representations are consistent with industrial design learning styles and industrial design working practise; supporting ideation and concept development processes. (See Figure 5-2b Left)

Industrial design is practiced, and from the entry point in defining the design space, these streams are dipped into as 'islands of temporality'. (Manzini, E., 2000), that allows designers to engage on multiple levels. (See figure 5-2c)

Figure 5-2b illustrates developments to a simplified industrial design process (Schon, 1983). The developments illustrated here show the impact of re-framing of the design brief, on this process

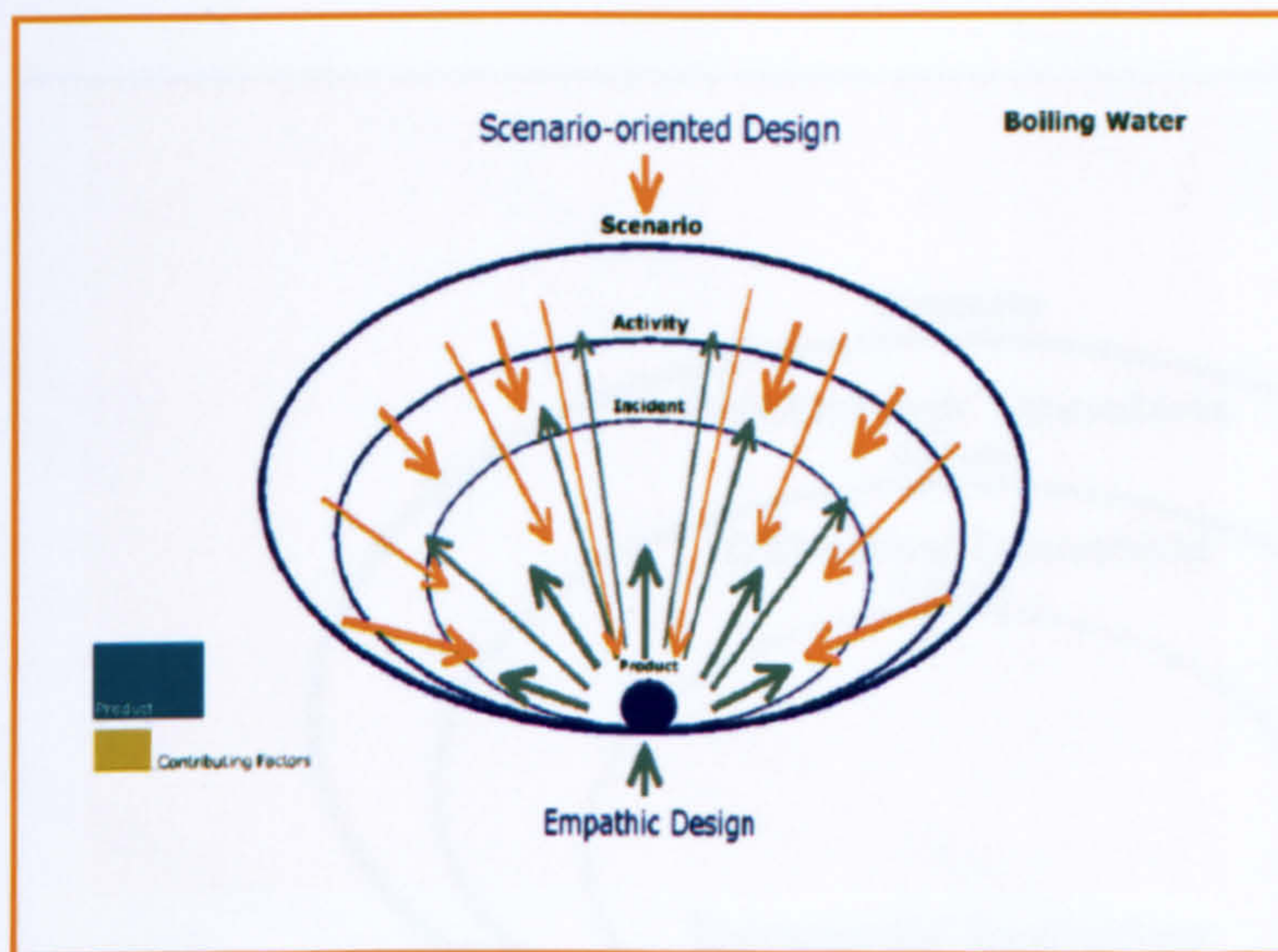


Figure 5-2c: Scenario approach to Empathic Design (New Development)

Figure 5-2c illustrates the change in direction proposed by the developments of the 'Empathic Design' methodology. It further illustrates the simplified levels on which the 'Empathic Design' methodology can be accessed by industrial designers. This is a representation of the simplified illustration presented to industrial designers.

### 5.2.2 Creating Levels of Information and Engagement

Findings from the exploratory pilot study indicated that industrial designers were both selective and sensitive to the material they were prepared to engage with in order to service their design processes. Information is accessed and responded to with visual language, key insights and identifiable inspiration-driven media are retained. In response to these insights, 'Empathic Design' could be engaged with by industrial designers to varying depths. (See Figures 5.2C & D). Though these levels are not transparent, specific customer understanding is uniquely organised in terms of customer activities – deliberately designed in response to industrial designers practises of accessing information. These activities are often displayed as visual maps illustrated in figure (5-2F). This allows key insights to be viewed by industrial designers and design teams where clarity of customer understanding is critical in complex activities. This is designed to prevent designers becoming overwhelmed by irrelevant data whilst maintaining the often, useful insights regarding the nuances of customer activities.



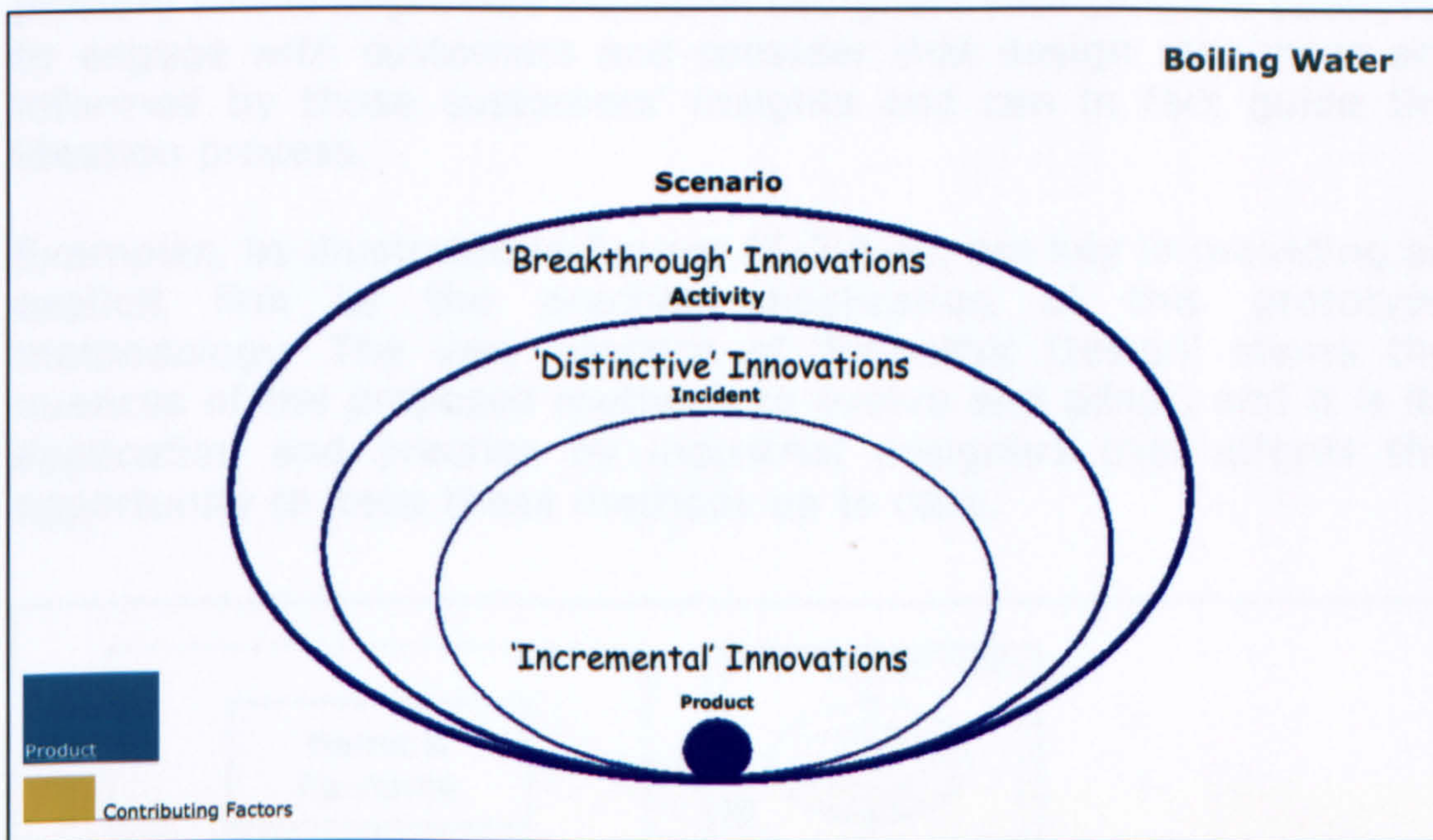


Figure 5-2d Potential levels of engagement (See also Figure 5-2d)

Figure (5-2d) illustrates the relationship between the three categorised levels of innovation and the access levels of the developed 'Empathic Design' methodology.

This approach is made possible because it integrates with individual, often organic processes adopted by industrial designers at the earliest stages of their ideation process and does not rely on a systematic or word intensive process. It embraces the richness of data sought by industrial designers, and uses this richness to inform and support this stage of the design process. Multiple layers can be engaged with and synthesised simultaneously, as insights are presented, mapped and communicated visually. (See Figures 5-2C and 5-2F).

### 5.2.3 Navigating between streams

As previously mentioned and illustrated in figure 5-2, Industrial Designers are required to engage with two streams in the service of their ideation process. These two streams co-exist within along the same industrial process continuum so to respond to specific characteristics of industrial practise identified during the exploratory pilot study. Significantly, industrial designers tendency to consider design responses independently of customer understanding, and customer information. The navigation of the two streams of the 'Empathic Design' methodology make explicit the connections

between customer understanding and design responses. The primary aim is to provide industrial designers with tangible catalysts to engage with customers and consider that design responses are informed by those customers' insights and can in fact guide the ideation process.

Examples, as illustrated in figures (5-2 A-F), are key in providing an explicit link to the practical application of this prototype methodology. The very practice of 'Empathic Design' allows the nuances of the proposed methods to evolve and adapt, and it is its application and practise by industrial designers that affords the opportunity to keep these methods up to date.

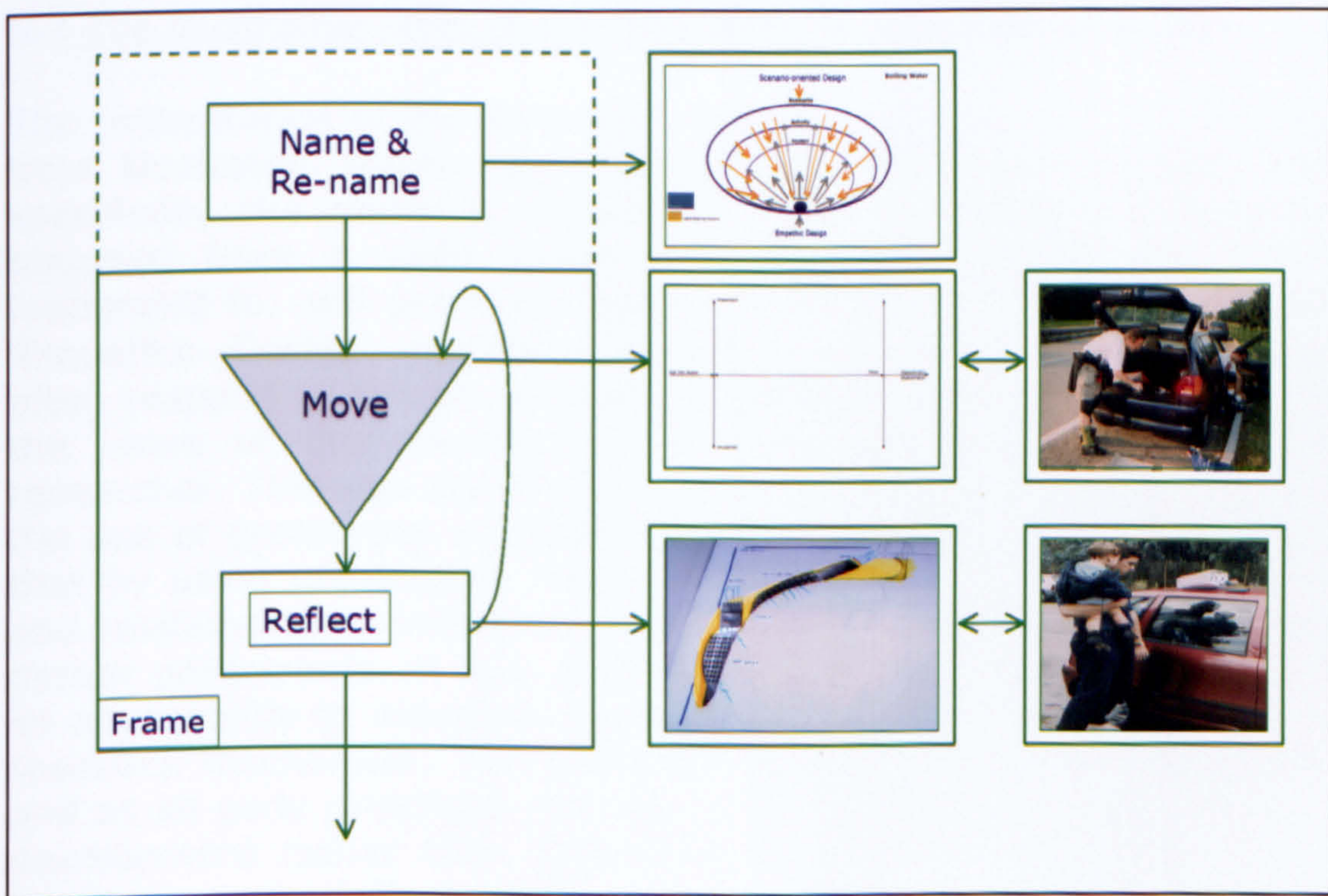


Figure 5-2E Informing 'Empathic Design' - Customer Understanding

Figure 5-2E illustrates a simplified industrial designers ideation process based on Schon's model of reflective practice (1987). It also illustrates, visually, the likely inputs, outputs and informants to this process. And how they extend the design space. In 5-2E as the designer shifts from a product to a scenario focused approach, the design space is extended. Scenario mapping and customer understanding tools both input and output as the industrial designer moves forward. The industrial designer reflects not only on the concept proposals, but the customer data, before beginning the cycle again. Except that with the reframing of the design brief, the industrial designer is now able to reappraise the initial framing in light of new knowledge gleaned from customer intimacy.

### 5.3 The illustrative style of the 'Empathic Design' methodology

The presentation of the 'Empathic Design' methodology has already been illustrated. During the development of this methodology, and specifically the methods employed within it, feedback has been obtained from a wide range of design participants who have responded to, and practiced specific methods, and or followed this 'Empathic Design' prototype methodology. Industrial designers often respond to design concept realisations, or prototypes, and so the value of this feedback mechanism was anticipated by the researcher. This was significant in the researchers decision to select the use of prototypes as feedback mechanisms. It was recognised, that by using prototypes, flaws in the nuances of use, application, and relationship to industrial design practice would be indicated by design participants. It was also recognised that significant flaws in its applicability to industrial design practice would jeopardise this a feedback mechanism. The prototype was presented as unfinished, and as an early prototype in order to actively engage designers in a development rather than a feedback process. A consistent visual theme remained in order to engage designers quickly and to provoke naturalistic use of individual methods. This deliberate visual style actively encourages the participants to adapt methods to the nuances of individual practice. The researcher felt that this mechanism would yield valuable insights into the nuances of the application of the prototype. The visual style of the prototype were designed to be responded to as a working prototype manual that designers could adapt, modify and question the methods rather than the presentation. The researcher was careful to ensure that the participants were not responding to the object qualities of the tools or the quality of the presentation more the quality of the guide and to feel equipped to repond constructively to it's proposal.

Text was kept to a minimum to allow a level of individual interpretation and to reduce the level of prescription as to the nuances of use and practice.

Although the broad visual stance was well received by many participants, it was felt that the details of specific methods didn't mesh exactly with the nuances of individual practice. That is that there was an initial reluctance to take a "leap of faith... the designs aren't immediately obvious". (Ids-com-1) "It's difficult to believe this works as I've never done it". (Ids-stu-4). Feedback further confirmed specific concerns regarding the levels of prescription required during the presentation of specific methods. Specific method presentations were adapted to deliver greater initial levels of prescription in response to reflective feedback. Ultimately, it was identified that designers wanted to engage with a methodology that was designed for their industrial design practise, and considered the nuances of their individual approach to design in it's presentation. It was felt that the presentation style was more reflective of tools rather than methods, specifically the association with visual presentation. Reflective feedback sessions explored and discussed the merits of presenting tools or methods, and with personal preferences as primary indicators it was felt that prescriptive methods or tools should be highlighted as cases of practise.

### 5.4 Guiding Principles

In order to guide industrial designers through the practise of 'Empathic Design' a number of guiding principles were developed and defined. These principles relented the prescriptive nature of the empathic approach proposed by Leonard and Rayport, 1997. the exploratory pilot study demonstrated the importance of providing a level of guidance within 'Empathic Design' practise, and using the approach proposed by Leonard and Rayport as a basis for developing guiding principles would provide an ethos to guide specific design practises.

The approach of Empathic Design as proposed by Leonard and Rayport clearly identifies customers as their primary drivers for innovation. Distinct development hypotheses, articulated during the exploratory pilot study have further developed the focus of these principles with a specific drive towards 'breakthrough innovations' highlighted in the literature review. The key attributes of this approach are simplicity and natural alignment to existing industrial design practise. Using the knowledge obtained through existing literature and the exploratory pilot study, the following areas of focus were identified for each stream. These formed the high level

guiding principles for the prototype methodology. Individual method guides balanced both levels of guidance and prescription across both streams.

### 5.5 'Empathic Design' Content

As highlighted in previous sections, the relationship between the two streams of 'Empathic Design' had to be explicit and aligned to industrial design practise. 'Empathic Design' charges designers with significant levels of responsibility for uncovering customer insights, and its integration into their own design processes. However, in the specific context of an industrial design team, the communication and synthesis of this information contributes to a collective ideation process. 'Customer Understanding' is charged with providing critical information and stimuli for the 'Ideation' process. The primary purpose of the two streams is reiterated below. The reflective feedback throughout this development stage confirmed that the methodological link between these two streams was a necessary requirement in an industrial design context. An explicit link between the customer understanding and ideation processes is not evident in the 'Empathic Design' methodology proposed by Leonard and Rayport. That this prototype methodology proposes specific methods for connecting 'customer understanding' methods with 'ideation' processes through the organisation, synthesis and communication of data is new.

Stream 1 – Customer Understanding: Facilitates the uncovering of latent and tacit needs of customers as drivers for innovation

Stream 2 - Ideation: facilitates the use and organisation of this information as drivers for innovation

#### 5.5.1 Stream 1: Customer Understanding

Engaging in direct customer understanding as a driver for innovation is first driven by customer profiles. Often these are provided via traditional market research techniques. There were significant data that were specific to design participants and the details of the processes used to generate these profiles remain sensitive. Specific customer data is often directly related to the automotive sector. This has much to do with the researchers intimate access to automotive ideation teams and processes with two European vehicle manufacturers during the exploratory pilot study. The researcher felt that it would be naive to ignore or disregard company specific, relevant data simply because it was specific to one company. However, care was taken to ensure that

sensitive data were not shared across participants, though key insights were allowed to inform the development of, and reflection upon the 'Empathic Design' methodology. In order to resolve this problem, company specific methods for acquiring and organising data were generalised and learning applied prior to wider participation. This allows the European Vehicle Manufacturers Ideation teams to access the methodology from a company specific entry point: (specific to their customer profile generation), whilst generalised entry points (informed by EVM ideation) were available to remaining participants. It is important to note that the only deviation from the prototype 'Empathic Design' methodology when considering EVM and industrial design participants is the entry point for external customer data and it's early integration with the prototype methodology.

Since this methodology actively engenders industrial designers to engage directly in developing customer understanding, data collected and interpreted is characterised according to the method within which it is being used: (See Figure 5-4)

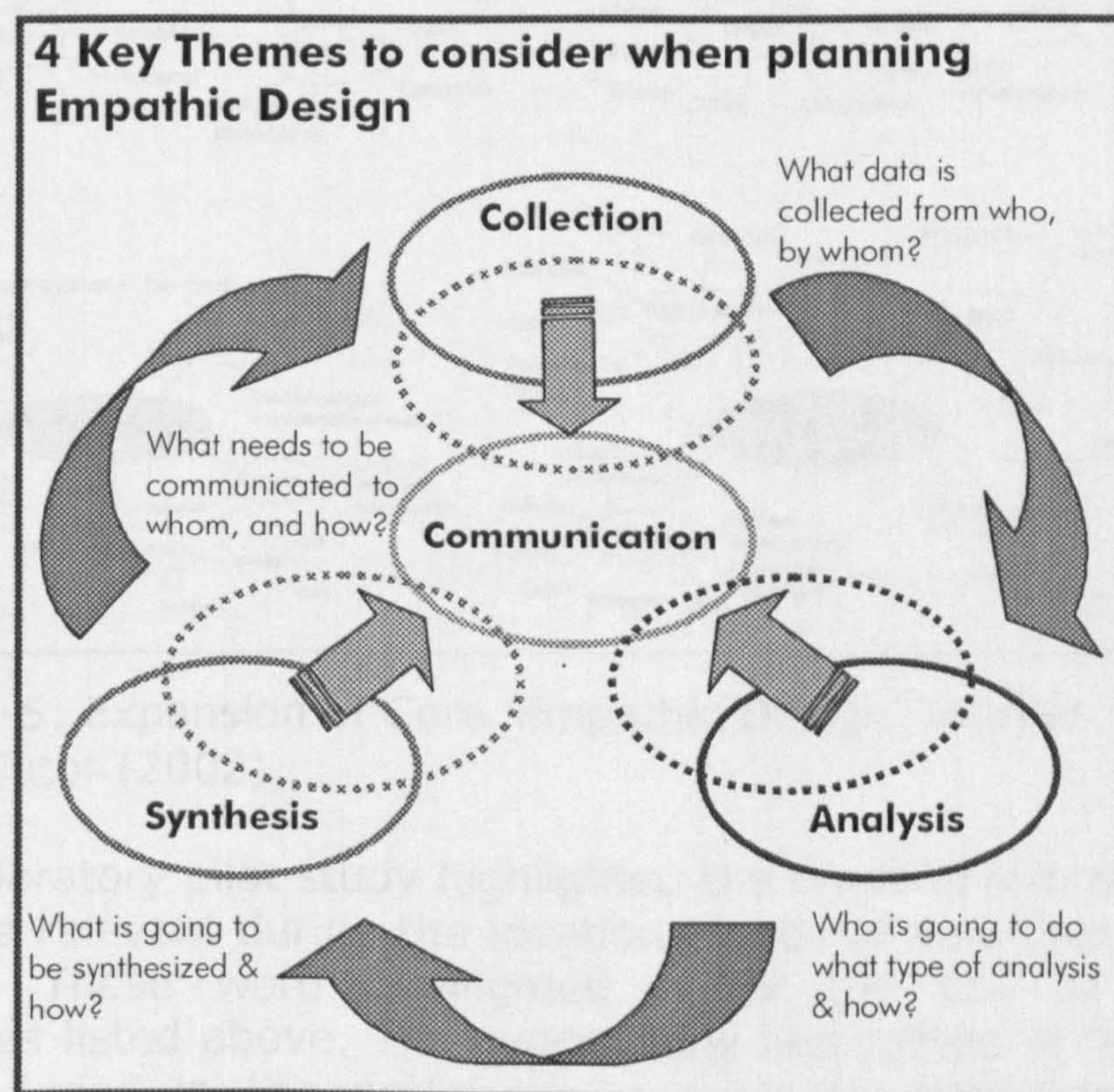


Figure 5-4 Key Themes of 'Empathic Design' (Burns, Barrett, Evans 2002)

- Collection
- Analysis
- Synthesis
- Communication

5.5.2 Stream 2: Ideation

Figure 5.5 maps the sub issues relating to the four categories that underpin and characterise the methods explored during the exploratory pilot study. These attributes deliberately dissuade designers from 'ticking boxes' and using the proposed methods as a prescription. These non-prescriptive cues seek to stimulate new pathways conceived and controlled by the very designers engaging in their practice.

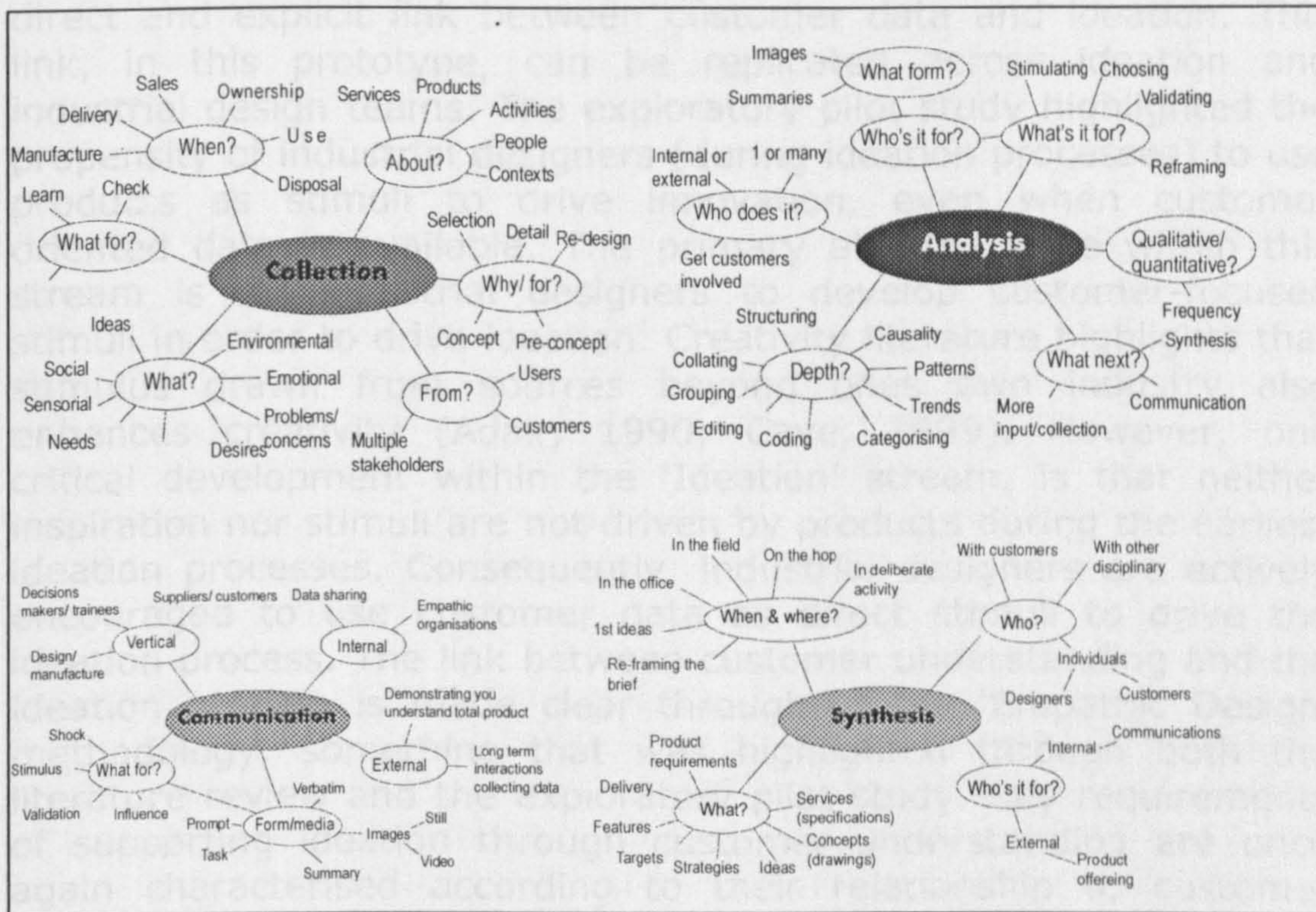


Figure 5-5: Expansion of Core 'Empathic Design' Themes. (Empathic Design Tutor (2002).

The exploratory pilot study highlighted the types of information that would be relevant during the ideation stages of an industrial design process. These were highlighted under the one of the four categories listed above. The suggestions highlighted in figure (5-5) were included in the prototype in order to maximise feedback potential in that designers could respond to specific suggestions based on findings from the exploratory study.

These suggestions were presented as cues and illustrated with examples wherever possible. These cues were sometimes presented

as a series of questions aimed directly at the participants' processes. Cues for customer understanding were no longer product specific, but activity specific.

### 5.5.2 Stream 2: Ideation

The 'Ideation' stream of the 'Empathic Design' methodology seeks to discover and support opportunities for customer driven innovation. The drive in the industrial design process as highlighted in the literature review is for inspirational material that can service the idea generation process. Critical developments over the empathic design approach (Leonard and Rayport, 1997) include a direct and explicit link between customer data and ideation. This link, in this prototype, can be replicated across ideation and industrial design teams. The exploratory pilot study highlighted the propensity of industrial designers (during ideation processes) to use products as stimuli to drive innovation, even when customer oriented data is available. The primary aim therefore within this stream is for industrial designers to develop customer-focused stimuli in order to drive ideation. Creativity literature highlights that stimulus drawn from sources beyond ones own industry also enhances creativity (Adair, 1990; Cave, 1999). However, one critical development within the 'Ideation' stream, is that neither inspiration nor stimuli are not driven by products during the earliest ideation processes. Consequently, industrial designers are actively encouraged to use customer data as direct stimuli to drive the ideation process. The link between customer understanding and the ideation process is made clear throughout the 'Empathic Design' methodology, something that was highlighted through both the literature review and the exploratory pilot study. Key requirements of supporting ideation through customer understanding are once again characterised according to their relationship to customer activities.

- Scenarios
- Activities
- Incidents
- Product specific interactions



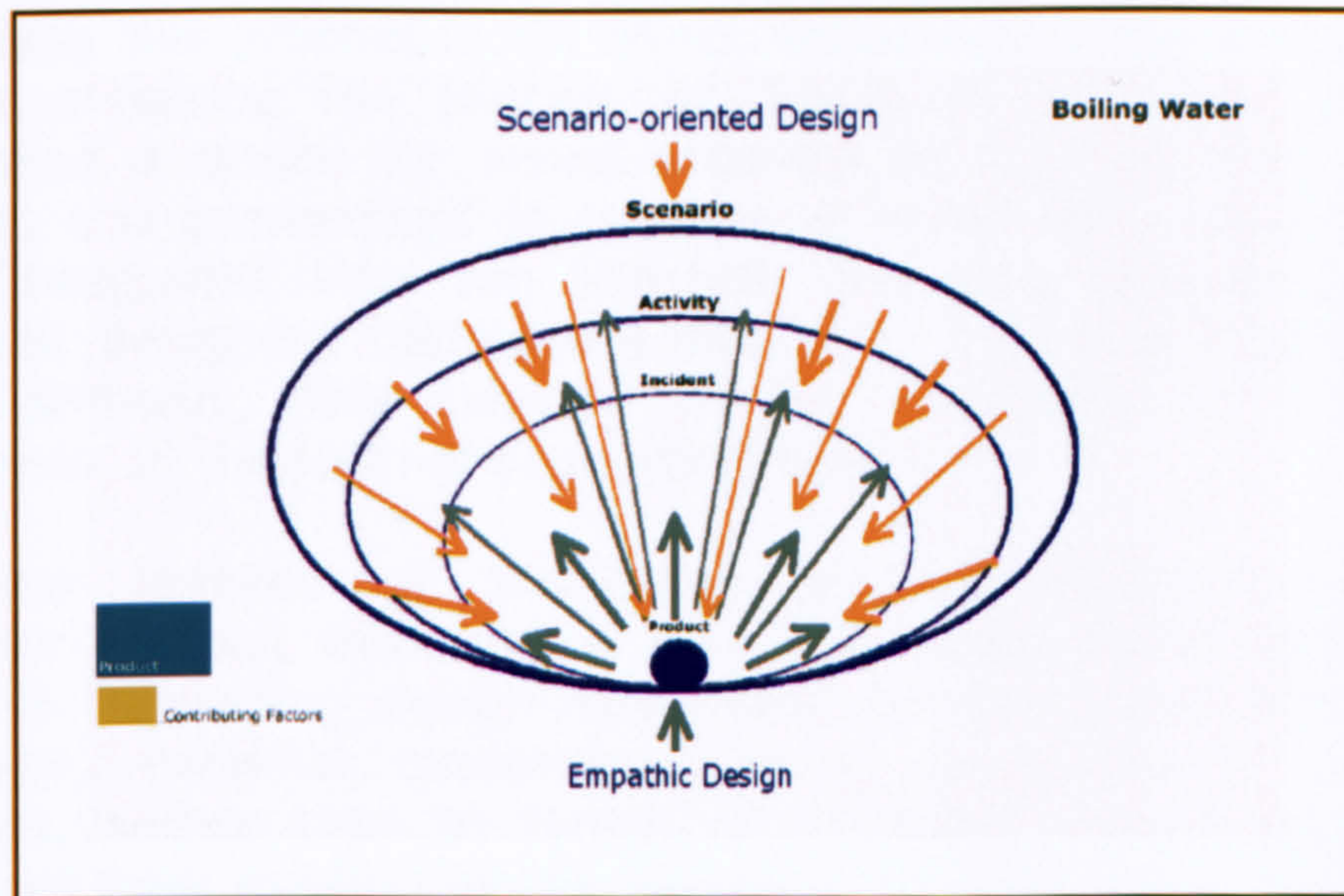


Figure 5-5A: Illustrated shift in direction from product to scenario

Figure 5-5A illustrates the journey between scenario oriented customer understanding, and the proposed design responses. It is designed when used as a delivery map, (see chapter 4), to allow industrial designers to make the connections between their design responses and the customer understanding that has informed them. It allows access on four simplified levels, Products, Incidents, activities and scenarios.

It was recognised that there was no clear definition that constituted any one of these identified categories. This was resolved by consensus amongst ideation teams as to the impact of specific customer data. Observations during this process highlighted that this interaction between team members, coupled with a revisiting of customer data often broadened the levels of understanding of customers and on occasions yielded new insights. Mapping processes facilitated the industrial designers ability to characterise customer data in terms of the above categories. This further engages designers in the activity of questioning the very customer paradigms they are investigating. Observing this stage of the prototype development process confirmed that industrial design teams recognised that greater impact upon customers can be achieved through engendering changes in customer behaviour. Critically, there was a recognition amongst participants that 'Ideation' can focus on this change in customer behaviour and understand the behaviour changes that design responses seek to affect.

Navigating this process is not direct. Governing principles guide but do not prescribe the process of 'Ideation'. Industrial designers articulated a desire for visual stimulus throughout their ideation process, and commented on the flow of ideas with visual customer data (integrated into the ideation process). However, though industrial designers highlighted that they responded primarily to visual stimulus, this needed to be supported by contextual awareness, in the form of supporting notes.

Criticisms levelled at traditional market research regarding customer profiles, were that it was "marketing waffle" that wasn't useful in supporting design responses. In the development of the prototype, external customer data is organised in terms of activities, rather than in terms of customer demographics. This departure from existing inputs, provided an entry point for industrial designers to engage in direct observation or customer understanding methods, based on identified activities. This is resolved through empowering the industrial designers to provide contextual awareness alongside visual stimuli throughout ideation: customer data directly informs and supports 'Ideation'. "it allows us to question things we'd never have considered important". "I think about situations completely differently now" " My design process hasn't really changed, but I can see real possibilities... I can completely change the way people do things". (Industrial Design Students, Level 3 – University of Hertfordshire).

This further emphasised the importance of synchronising customer understanding and ideation processes. One designer commented that information flow during the idea generation process; the filtering of stimuli. Mapping data supports this process and allows designers to easily cluster activities, and product interactions visually. This affords designers a method for connecting product innovations with the activities they seek to affect – but more effectively, understand the collective impact of individual ideas or solutions upon entire scenarios. "... to support 'breakthrough' innovations, by changing the way we organise data". (Ideation specialist – Advanced Product Group. Ford). These methods for mapping and organising customer data were implemented in the prototype 'Empathic Design' methodology, specifically to integrate both streams and align with existing brainstorming sessions.

### 5.5.2.1 'Ideation' Brainstorming activities

The exploratory pilot study highlighted a specific requirement to support and guide brainstorming activities and to maintain their

focus on customer data rather than its existing reliance on product specific stimuli. Methods and cues are implemented in the prototype 'Empathic Design' methodology (on an experimental basis), to encourage frequent use by design participants and to facilitate customer-driven ideation; customer oriented creative thinking (Adair, 1990; Allan et al., 1999). Method cues and non-prescriptive presentation helped to ensure naturalistic use during ideation processes.

Brainstorming activities were directly linked to the synthesis of customer data that were deemed appropriate to solution development by the industrial design participants.. Designers are encouraged to map relationships between scenarios, activities, incidents and products in order to map how the design of products can deliver 'breakthrough' innovations. This responds to the needs identified in the exploratory pilot study, that industrial designers need support in developing an ethos of 'Customer driven Ideation'.

This process was designed to bring together real customer needs with what is possible, as proposed by Leonard and Rayport. With one significant change: the transition from customer understanding (in terms of scenarios and activities) those that are capable of generating 'breakthrough' innovations, and product concepts – stimulated by those needs, capable of responding to those needs, thus allowing designers to engage with the new scenarios they generate through product identity. 'Customer driven Ideation'. " this methodology may provide us with the opportunity for developing visual cues for product identity... this could have the potential to develop new contexts and customise the way people identify with those contexts? Couldn't it? (Design Director – Herman Miller furniture). This significant difference stems from the initial reframing of the original design space, so that subsequent investigations are now scenario rather than product driven. This have the dual benefit of removing product constraints and asking questions that have greater significance when considering customer activities and engendered changes in behaviour. The investigations that these questions stimulate can therefore support and stimulate focused ideation processes that can deliver new scenarios and activities and provide industrial designers with the opportunity for products that can be identified with these new scenarios. In short products that can deliver 'breakthrough' innovations and know why they deliver it.

This process was considered and presented as experimental, though it was sympathetic to industrial design practise and was solely

designed to provide support in refocusing the stimulus for initial ideation processes.

### 5.6 Summary

This chapter has described the format and the content of a prototype 'Empathic Design' methodology that was developed for this research study using the criteria identified through the exploratory pilot study. It represents the first attempt made to apply these principles to the development of a methodology intended for industrial designers and that can be applied in industrial design practise. This methodology is unique in its focus towards customer needs as drivers for innovation; more specific types of innovation. The real novelty however, is in it's application. This is the first methodology to empower industrial designers with streams to understand customer activities and focus ideation upon customer activities. The idea of Empathic Design, presented by Leonard and Rayport in 1997, shattered the mantra "listen to the voice of the customer" and stimulated world-class industrial consultancies to observe their customers. However, Empathic Design was always product specific. Flaws were also identified in its application, in that the methodology didn't extend to connecting ideation to customer understanding. The exploratory pilot study highlighted the disconnected processes of customer understanding and product ideation. This prototype was developed through the understanding generated through the exploratory pilot study with consideration to the needs of industrial designers and their practise. The 'Empathic Design' methodology is not regarded as definitive to industrial design practise, nor is it regarded as a finished product, but as a mechanism through which the theory (generated from empirical data) can be tested.

In chapter 6 (The Main Study), the approaches for testing the prototype methodology will be outlined. The emergent findings are used to test the hypotheses that were developed and defined at the end of the exploratory pilot study.

## 6.0 The Main Study: Research Investigation

### 6.0.1 Chapter Summary

This chapter presents the findings from the main study within this enquiry. It aims to test and expand upon the emergent research hypotheses from the exploratory pilot study. Through this study, a better understanding of the characteristics of an industrial designers' practice of a developed 'Empathic Design' methodology are attained. This chapter will seek to describe those specific aspects of the 'Empathic Design' methodology that impact on industrial design practise and the connections to customer understanding. Findings are presented and discussed and will inform further discussion in the following chapter.

### 6.1 Moving from the Pilot to the main study

This section presents the key research findings from the main study. It begins with the transition from the exploratory pilot study to the main study, as the findings from the exploratory pilot study were used as the basis and the starting point for the main study.

### 6.2 Overview of the Main Study

The prototype 'Empathic Design' methodology was developed to reflect and consider the central research themes of the hypotheses generated in the exploratory pilot study. The primary aim of the main study was to obtain feedback and observe the practise of the prototype 'Empathic Design' methodology, from a range of participants (See Appendix A) in order to provide data to test the validity of the research hypotheses. As explained in chapter 3, testing was carried out using multiple cases in order to maximise the opportunities for obtaining feedback and observing the nuances of and industrial designers' practice and implementation of a developed 'Empathic Design' methodology. These multiple cases were selected to increase the generalisability of the findings and provide a more comprehensive basis for hypotheses testing.

During the main study the prototype 'Empathic Design' methodology was tested by a total of twenty six participants (eleven industrial designers and ideation specialists and fifteen industrial design students) across a number of industry sectors. (Table A-6 provides detailed descriptions of the experience and industry sectors of these participants). Each participant was presented with a prototype 'Empathic Design' methodology and was required to identify specific innovation projects where this methodology would

be practiced. Observation sessions took place during these projects, though the researcher made no intervention into the practise adopted by the participants. Following the completion of these projects, feedback was collected through a combination of semi-structured interviews, structured interviews and observations. Interviews were conducted face-to-face wherever possible with a prototype methodology presentation responded to as necessary. All interviews were tape-recorded or video-recorded as necessary. The data was transcribed (See appendix E for example interview framework) and key quotes and observations were coded and clustered as conducted in the exploratory pilot study. All of the participants involved in the testing process, expressed interest in the methodology, but for varied reasons and on varied projects. These reasons are summarised below in Table 6.1:

Participants	No:	Reasons	Sample Outcome
Design Consultants	5	Support new brainstorming projects + general interest	Develop new concept proposals for microwaves
Industrial Design Students	15	Support design projects and 'live' collaborative projects	Concept proposals for new photographic experiences
Automotive Designers	5	Support new innovation projects & general interest	Developing new vehicle portfolio
Herman Miller Designers	2	Investigating new methods to deeper understand customers	Understanding tacit knowledge sharing in the office

The nature of feedback obtained from the participants was representative of the practice of critical review or reflective practise normally adopted by industrial designers during current projects. It focused primarily on the practise of 'Empathic Design' and its impact, when considering the normal practise adopted by industrial designers during the 'Ideation' and concept development stages of an industrial design process. Much feedback focused on the use and practise of specific methods and how they could better mesh with current individual industrial design practises. The researcher expected both positive and negative responses through the very nature of presenting an unfinished prototype to industrial designers, trained to critically review prototypes. This level of feedback was considered essential to developing further understanding of industrial design practises of ideation and customer understanding. The feedback obtained from the Main study served two specific functions. Firstly, it provide opportunities to catalogue suggested improvements, from a designers response to a now existing 'product'. Secondly, it provided a series of view, opinions and

articulated insights as to the preferences, needs and requirements used to test the hypotheses. This chapter will continue to present the hypotheses testing which was carried out using the feedback obtained from this research study.

### 6.3 The collaborative process throughout the investigative study

Following the exploratory pilot study, collaborative proposals from the researcher ensured that the prototype 'Empathic Design' methodology could be tested on 'live' innovation projects. These 'live' projects were in the case of industrial participants projects designed to innovate concept design responses aimed at informing the development of new vehicle or product programmes. In the case of projects adopted by industrial design students, these were either industrial collaborative projects, providing a valuable parallel stream of innovation driven concept design responses aimed at stimulation innovation 'live' innovation projects; or entrants to national design competitions with requirements for 'breakthrough' innovations.

The key collaborative period of the main study was undertaken between February 2002 and May 2003. It was during this period that the researcher had the greatest access to participants, gaining valuable opportunities for observation and feedback based upon the use and practise of a prototype 'Empathic Design' methodology. The data collection and analysis within this context was a simultaneous and concurrent process, allowing the researcher to observe and test the development of Hypotheses that emerged through the exploratory pilot study. The researcher's intimate access to these projects allowed key themes to be revisited, questioned through these 'live' projects as evaluation mechanisms.

The researcher selected 'live' collaborative projects for the main study for a number of reasons. Critical to this selection was the balance between naturalistic professional processes present in industrial collaborators, and increased level of control that can be exercised by the researcher in terms of external project influences, time scales, together with the freedom of students when considering, political and financial intervention.

## 6.4 Hypothesis 1: reframing the design brief and understanding activities contributes to driving ideation processes towards 'breakthrough innovations'

### 6.4.1 Brief

During the main study a series of 'live' projects were conducted in order to test the emergent hypotheses from the exploratory pilot study. The Brief for this project was a level 2 degree collaborative Project with Herman Miller. The Design brief can be described as follows:

The brief: To develop a new concept for one for office environments:

"It is essential as a designer of objects, not to accept the norms as assumed. If we were to do that, we would not only fail to put ourselves one step ahead of the customer but also ensure that our product development stands still, which is exactly the opposite of what our clients require of us. Having said that, formats may be stipulated in a brief, or the sensible solution may be the one in current use. That doesn't stop us reconsidering it! Very often a Product Designer's main contribution comes from a fresh approach to existing solutions, and there is a particular bracket of products where in any case, no standard format exists. In these instances, the product will arise out of the design analysis of the function, but more importantly from observing the scenario of use." (Richard Barrett, 2000).

The project brief is separated into two phases: customer investigation and concept development. During phase 1, the researcher intervened into what would have been typical task analysis following specific developments to the Empathic Design methodology proposed by Leonard and Rayport, (1997). These developments will be highlighted later in this section.

#### Phase 1: Activity Scenario

This phase of the project focuses on the ideation process. It presents the brief as the knowledge and understanding of what it is that actually needs to be designed. It is made clear that by observing customer needs and investigating potential technologies industrial designers will be in a capable position to write a design brief. It is also made clear that this is a 'clean sheet' project; that is with no specific product-led constraints. Participants are required to



assume that none of the existing products necessarily meet the requirements defined by this project phase. This is therefore a design process from the first principles of an Empathic Design methodology. During this phase participants were asked to consider the following:

- What it is used for?
- Where it is used?
- Who uses it and why?

Participants were then asked to consider how the above can be better achieved, and to consider the product form the following perspectives:

- The users standpoint
- On a functional level
- Production and materials

This was presented as a holistic approach that considers a design proposal from multiple perspectives and through the eyes of multiple stakeholders. It has been designed to challenge pre-conceived ideas, and also to highlight opportunities to develop new solutions. Both radical and rational approaches were considered by participants. this phase would identify the drivers for the development process, and identify a specific product design brief, generated by industrial designers. The overarching guiding statement for participants for this phase, and an aide memoir for this exercise was visually available throughout each presentation:

“Design the right thing, AND design the thing right”.

Care was taken by the researcher to ensure that language and communication media throughout briefing processes were consistent. Care was also taken by the researcher to ensure that each document and discussion contained consistent messages through the use of prompt cards and cue statements.

These mechanisms also served to ensure that the researcher was able to avoid leading questions, suggestions, advice and solution ideas.

### Phase 2: Development

During this project, development was conducted as a concurrent activity. It was conducted alongside the scenario investigations and the research. Participants were reminded that the purpose of the

Design methodology and example tools and techniques. This 6-week research phase aimed to collect wide ranging and relevant customer focused stimulus for the project. The methods by which this stimuli could be collected was left to the participants in as far that the information must use an inclusive rather than exclusive approach and that the information would enable participants to get closer to their customers so that the information can be used to inform an industrial design process. However, students were required to intimately understand customers using primary sources. For example, direct observation, role-play and memory triggers. (These were highlighted as example techniques during the briefing process by the researcher). This information would impact upon stages 2 and 3 as the observed needs of customers would form the criteria by which an existing product would be assessed and inform the idea generation and concept development processes. This research would be conducted in design teams formulated according to their product selection.

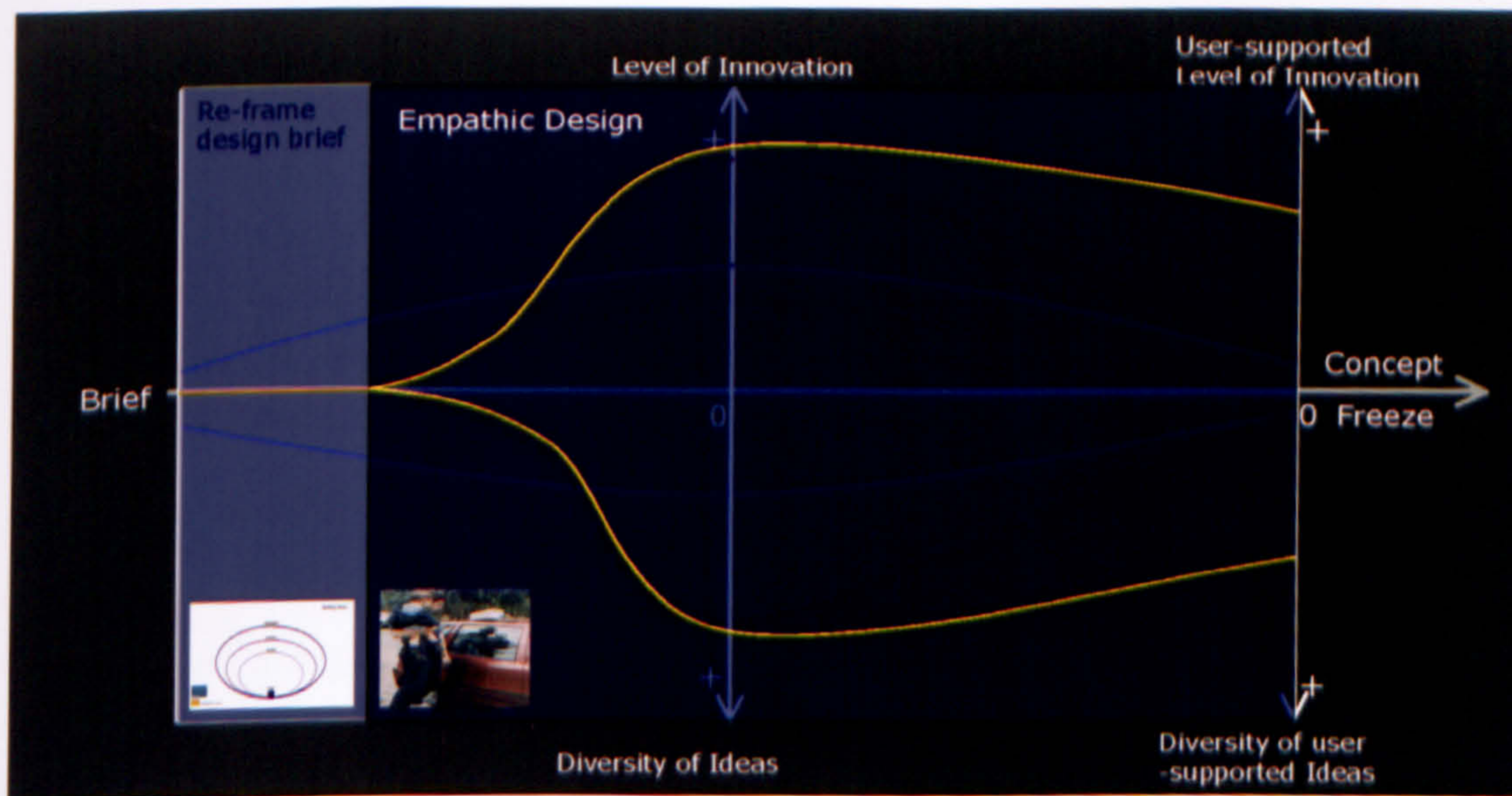


Figure 6-2: Level of diversity and innovation.

Information could then be used on an individual basis through stages 2 and 3 of the project.

## Stage 2: Idea Generation

Figure 6-2 highlights levels of diversity when considering ideas following the reframing of a design brief. Following the briefing process, the reframing process takes place in advance of an ideation process (no ideas are generated during the reframing process). The removal of product inferences and the refocus towards overarching customer experiences and scenarios produces a wider initial exploration of ideas based upon people rather than product interactions. An illustration of this difference is shown between the solid blue line and the dashed red line. Other aspects of figure 6-2 will be explained later in the chapter.

The project brief was kept as close to that set in the exploratory pilot study as possible and set to a year group of comparable abilities and with similar knowledge of industrial design practise. The researcher ensured that language, terminology and presentation were consistent with that used in the exploratory pilot study.

This brief was selected to test hypothesis 1 simply because it was able to generate a sample size capable of supporting the level of innovation and diversity required to test the re-framing of the design brief. Since this is a 'live' project Level 2 students would feed both 'customer understanding' and concept development level design responses into the 'live' innovation project that runs concurrently at 'Herman Miller'.

### 6.4.2 Process:

The initial reframing of the design brief requires that the industrial design participants are not required to produce design responses, physical outcomes were deliberately removed from initial design objectives by the researcher. The requirement is for 'customer understanding' to drive the briefing process. It is this step back from the prescribed design problem that can shatter the mould that confines the ideation process to existing customer paradigms. The office environment therefore is replaced with 'work' as an initial area of investigation. Cues are provided to guide 'customer understanding' processes.

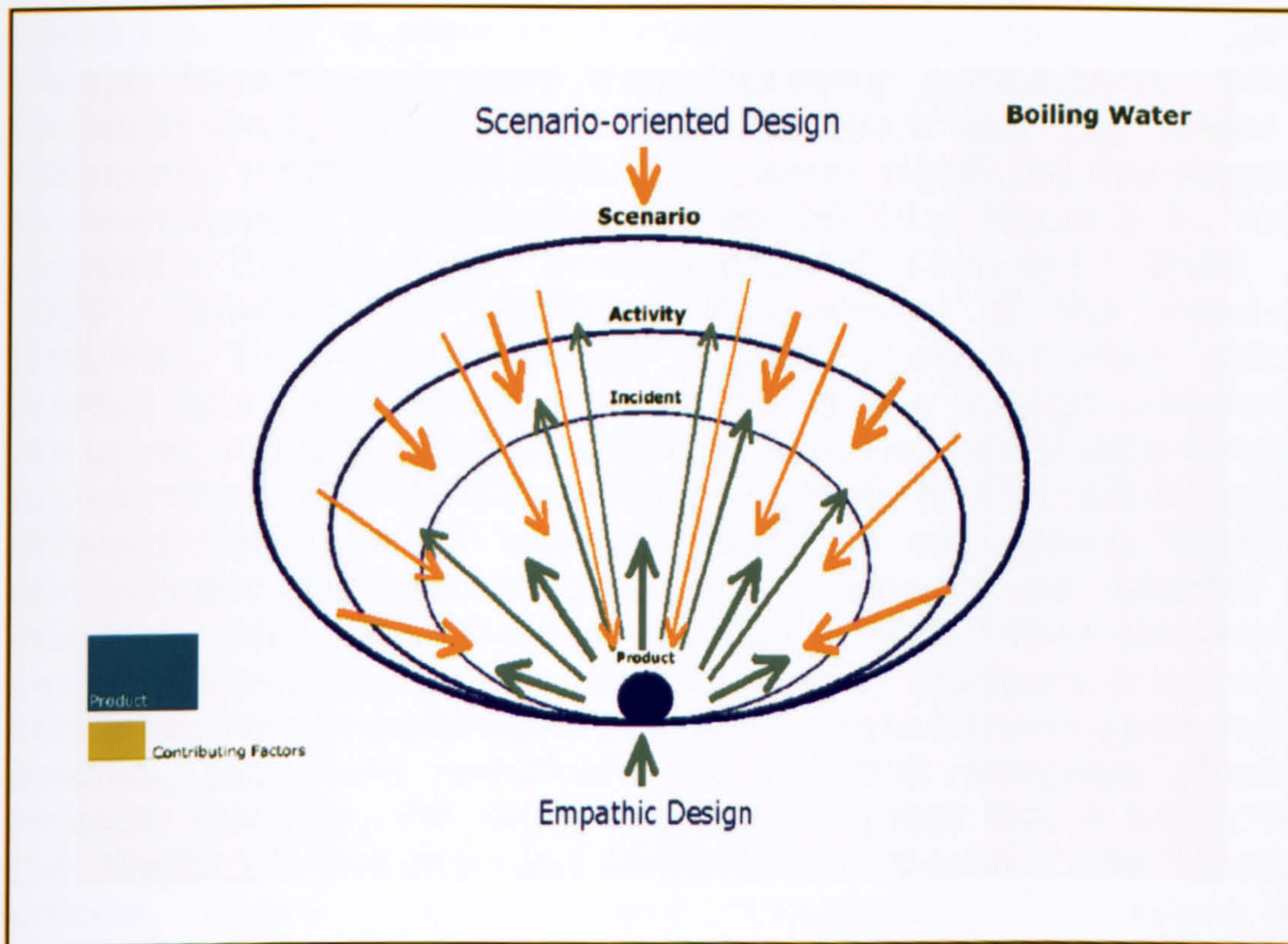


Figure 6-3: Reversal of Empathic Design's entry point (Empathic Design Tutor, 2002).

Figure 6-3: demonstrates the key change in industrial designers' interpretation of Customer experiences, observed during this aspect of the main study. The grey direction arrows indicate that the customer understanding process begins with a product, and through the investigation of products, product interactions do industrial designers investigate customer activities. Key to the development of the 'Empathic Design' methodology is the limitation of its initial proposal to understand overall customer scenarios and experiences. Designers become too close to products during the investigation processes. The reframing of the design brief transfers the initial point of investigation to customers' experiences. This makes key changes to the industrial designers process and interpretation of the design brief. These are:

- Designers are no longer constrained by the design space represented by current products.
- Overall customer experiences become the focus of early investigations
- Design responses are generated in response to customer experiences rather than moments of product interaction

Further support is provided beyond those highlighted in Empathic Design because we start from opposing perspectives. Whilst Empathic Design seeks to uncover the latent and tacit needs of customers, it begins with products, requires significant investigation to move beyond mere product interactions (See Figure 6-3). IDEO overcome this issue by “employing great designers” (Black, A. 1998). However one significant development of the prototype ‘Empathic Design’ methodology is that it doesn’t start with a product at all, but derives product innovations through uncovering the latent and tacit needs of customer activities rather than through the identification of specific product interactions. This carries with it different challenges for industrial designers undertaking ‘ideation’ and concept development processes. Designers are required to interpret wider experiences of customers rather than uncovering insights associated with product interactions. Guidance is therefore critical in order to understand how this process impacts upon design process, and more specifically an industrial designers ideation process. However, this study has demonstrated that if supported, the levels of diversity and innovation throughout the ideation process increase significantly, but critically, these innovations are grounded in ‘customer understanding’. (See Figure 6-4). It is important to recognise that the role of the researcher during the ideation process of this exercise was as an observer. The researcher ensured that no guidance was provided during the ideation process, and that participants adopted their current industrial design processes. Though, it is important to recognise that the intervention of new practises will have an influence over current processes. The harmonisation of new processes can however be represented through the working processes of the participants.

#### 6.4.3 Findings

The findings from the pilot study suggested that guidance is a critical element of the ‘Empathic Design’ methodology for industrial designers. Feedback suggested that this guidance should take the form of a supporting structure rather than prescriptive tools. Designers expressed reservations associated with the prescription of a design formula.

“Design is not a formulaic process... it’s much more haphazard than that.” (IDS-COM 3).

However it was important during this design exercise that much of the design process adopted by industrial designers remained constant. The researcher took great care through careful guidance,

observation, and careful construction and segmentation of design phases in order to retain clarity as to the impact of the reframing of the design brief. The feedback and observational data that were gathered during this design project, illustrated that the reframing of the design brief impacts, not only on the subsequent design processes, but makes key alterations to the definition of the design space. Feedback noted specifically that freedom afforded by the removal of product inferences from the original interpretation of the design brief, provided critical new breadth to the operational design space. Feedback further clarified this breadth in terms of breadth afforded in terms of new design possibilities and in terms of designers' perceptions and interpretations of customer experiences. Critically designers articulated that removing product inferences at this early stage elevates the customers' position as a stakeholder in the design process. Customers and their experiences are now the primary catalysts for ideas.

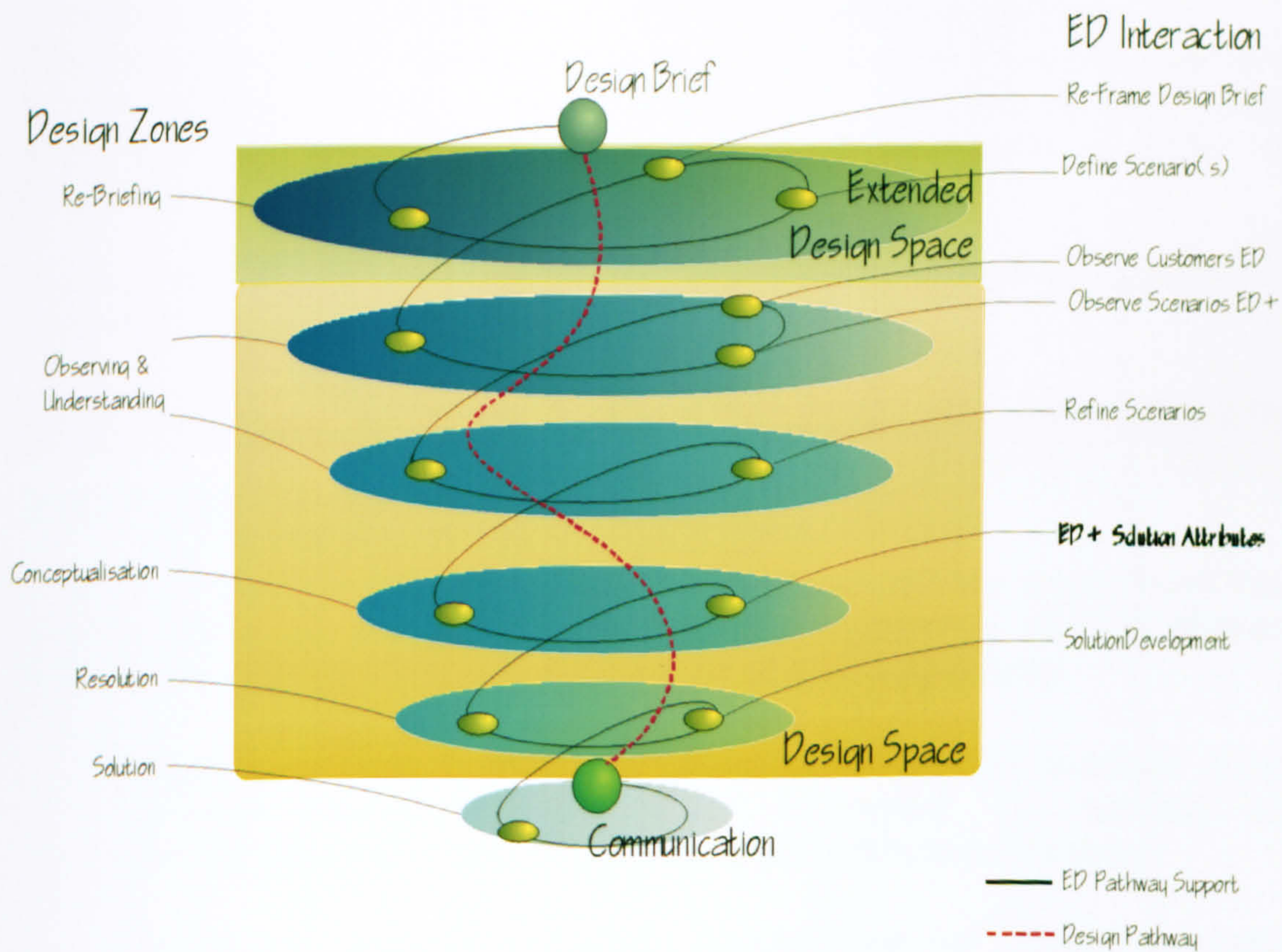


Figure 6-4 How Empathic Design Methods Support for new design space created by a shift from products to scenarios.

Designers noted that the model of design space (Figure 6-4) presented as a visualisation of the intervention of the 'Empathic

Design' methodology clearly captures that the reframing of the design brief is key to the successful development of the 'Empathic Design' methodology. This suggests that the early guidance that supports the reframing phase, ensures that designers have enough support and opportunity to build up an understanding of the principles of empathic design in a 'hands on' manner that is consistent with industrial design practise and learning. This proposed the empathic design methodology and in particular the reframing of the design brief as critical in that rather than prescribe a formulaic approach, it presents opportunities to designers. This was clearly articulated, by many participants as key in their acceptance of this as a design method.

This aspect of the main study has provided the opportunity to develop a more detailed understanding of industrial designers interpretations of reframed design briefs together with more detailed understanding of the level of guidance required to provide and support direction and involvement in 'empathic design'. The findings of this aspect of the main study show that this element of the 'Empathic Design' methodology; the reframing of the design brief reorients and refocuses the minds of designers in order to broaden the range of design possibilities.

To summarise, the key Findings from the testing of hypothesis 1, are indicated as follows:

Hypothesis 1: Reframing the design brief and understanding activities contributes to driving ideation processes towards 'breakthrough innovations'

Almost all participants were observed to have shifted away from the familiar product paradigm following the reframing of the design brief. This shift embodied a number of characterisations:

- Designers began drawing on visual material outside their normal boundaries of visual reference. A number of participants were observed looking at different material
- Designers considered the implications of their concept proposals more systemically. Almost all participants considered what change in behaviour may be required by customers.
- Participant outcomes were deviated significantly from the current product offerings in this sector. (See Figure 6-2)

- All participants commented on the volume of ideas generated as a result of this process. (See Figure 6-2)

We should note that almost all participants displayed all of these characteristics and commented on the relative success (given that this was the first opportunity for the participants to use the prototype methodology). It should also be noted that all the participants noted a positive response to their proposals connection with customer activities – though this is tested in hypotheses 2. The critical conclusion from the testing of this hypothesis is that the levels of innovation (that is those innovations that deviated from the familiar paradigm) and the levels of diversity (that is the variation in design outcomes in response to an activity-centred brief exceeded all participants' expectations.

#### 6.5 Hypothesis 2: Communication shift: Artefact to concept; maximising impact on customers: Organising stimulus for ideation and concept development facilitates the drive for 'breakthrough' innovations:

##### 6.5.1 Brief

This brief was developed in response to the hypotheses that industrial designers, even when their 'ideation' and concept development processes are grounded in customer understanding, rely on their design outcomes to communicate the intellectual value contained within a design response. During the exploratory pilot study designed responses were presented as disconnected from the 'customer understanding' processes that have supported these design responses.

This design brief was constructed as a 'live' project in collaboration with the Ford Motor Company's 'Advanced Product Group' and industrial design students at the University of Hertfordshire. This aspect of the main study was selected to maximise the realism of a true industrial context. A small team (4) of industrial design students worked intimately with an advanced project team (4) from the advanced product group at Ford. The aim of the feedback from this aspect of the main study was to identify and characterise the relevance of customer information to designers under representative industrial pressures approaching the concept product planning gateway in a vehicle development programme. That is the articulation of vehicle requirements for initial product development.

It is important to note, however, that the researcher was only able to acquire limited understanding of what constitutes 'relevant'



customer data during the development of the 'Empathic Design' methodology. These were not data previously identified in design literature, nor were they evident in current design practise.

In response to this dilemma, the researcher provided guidance as to the acquisition of customer data, and to it's organisation. Feedback on this process through a series of semi-structured interviews were useful in this aspect of the main study. Guidance was also provided by the researcher with respect to the distillation of customer data.

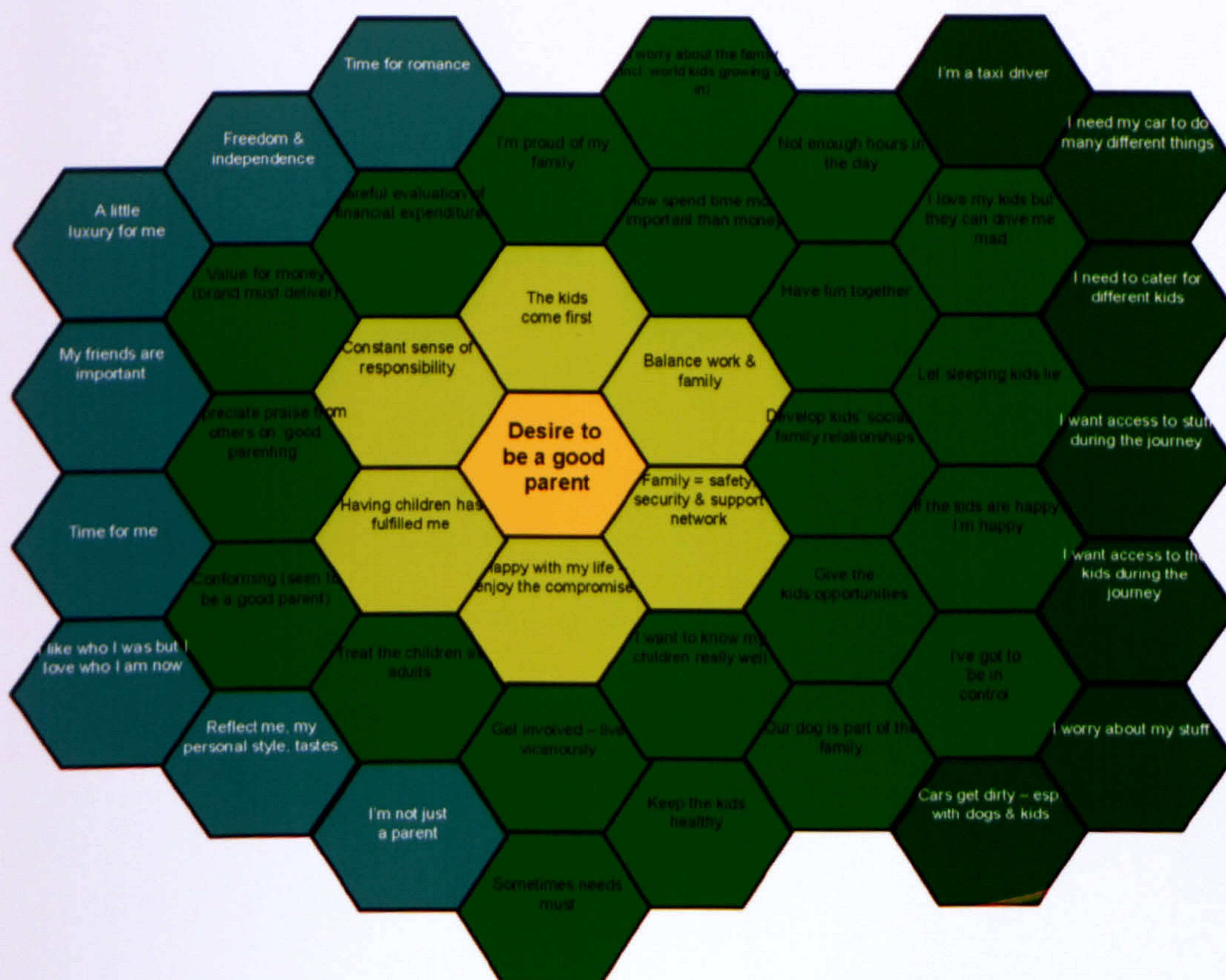


Figure 6-5: Example guidance to provide connections between customer activities and to track relationships between customers underlying needs and customer activities.

It is important to note that this guidance was necessary to overcome time constraints imposed by the nature of a 'live' project where designers would normally be afforded greater opportunity to assimilate data prior to the delivery of this type of project. Care was taken by the researcher and the participants to ensure that information was presented in a language that was transferable across design teams. This aspect of the main study, that is

the language of information presented to designers, will be discussed in detail later in the chapter. However it is important for the reader to note that in this section, customer data has differed from that presented either to or by designers using existing tools or methods. This was recognised by the researcher as a limitation in this aspect of the study, and this was also recognised by participants. This 'work in progress' therefore, it did not propose 'new' information, more provided a mechanism for accessing and 'touching' that customer data. The researcher considered that providing a partial solution would in fact encourage participants to be more explicit when responding to the nature of the information and 'customer understanding' they were seeking.

Figure 6-5 illustrates a different visual format of the delivery maps discussed in chapters 4 and 5. (the three colours replicate the three concentric circles). Its aim is to visualise the connections between the key latent needs of customers and the activities, incidents and products that contribute to that latent need. It is designed to create a shared language between members of the design team. Although this illustration is populated with words only, it is common practice during this aspect of the study for participants to populate the map with photographs and notes in order to "share the depth of understanding". (Ids-com-2).

### 6.5.2 Process

#### Phase 1:

The initial discussions took place between the researcher and the proposed design team to set out time scales and project parameters. We were able to reframe the design brief in terms of customer experiences in advance of the project start date, and identify team members.

A high-line brief was identified and proposed, with guidance areas supported by the researcher. Design participants were to investigate experiences associated with young families and vehicle use. Key areas of interest were identified prior to the commencement of the design exercise. This has been noted as a limitation of collaborative 'live' projects since the researcher must conform to the agenda of the design team. It is for this reason that the researcher chose to use this design aspect to address the presentation, communication and use of customer data rather than its acquisition. (See Figure 6-5)

Design participants worked closely as a team during this phase in order to identify opportunities to engage with customer activities. The researcher restricted the size of the observation teams to ensure that the team had to communicate and share data throughout this phase of the study.

In general feedback at this point in the project was positive. Not only in response to data collection, but the ease with which it is shared and accessed.

"I'd use the video for brainstorming... and to get someone else's thoughts" (ID-COMP-9)

"It's great that all of us can make the connections... it gives us all touch points". (ID-COMP 10)

The process consisted of direct observation and the use of developed empathic design tools to better understand customer activities, and a series of scenario mapping processes using post-it notes, photos, visual material and felt pens.

"It's simple, we can all see the connections – and make new ones... we can also identify connections that we've overlooked and might be important". (ID-COMP 8)

"I like this because we can share this across programmes". (ID-COMP 10)

It is important to note the limitations of data collection at this point in the study. Project time constraints restricted data collection opportunities, though this has limited effect upon data use.

## Phase 2: Ideation

Based on the connections identified in phase one, design participants were encouraged to generate ideas and design responses in order to influence those connections. That is, using the delivery map(or variations of), they would identify potential ideas that respond to scenario-oriented customer data, which were in this instance 'emotional connections'. Design participants were also encouraged to consider the cumulative effect of ideas in relation to the underlying customer need, and the relationship between each of the ideas generated in response to that need. At this point in the study limited and consistent guidance was provided by the researcher in relation to mapping tools only, not in the use of, or communication of data.

Brainstorming sessions were recognised by participants as more structured and more directed than they had previously been used to, and as such this provided mixed reactions. It was noted throughout feedback sessions, that customer data provided a useful vehicle or catalyst for generating, focusing and connecting what would normally be regarded as disparate ideas.

Following the ideation process, ideas were selected on the basis of their contribution to customer activities. Though it is important to note that ideas re disregarded due to time constraints that were considered equally valid.

Participants were asked to present their concept developments in terms of their relationship to customer activities and to 'tell the story' of those relationships.

### 6.5.3 Findings

In order to communicate relationships as complex as 'emotional connections' required in this design brief, customer data, particularly visual material was key to communicating the appropriateness of their design responses.

"It just seemed to work with my design process" (ID-STU 2)

"I was incredibly sceptical, I didn't really have a great deal of faith in it's ability to support ideation OR communication". (ID-STU 2).

Feedback focused primarily on the ability of customer data to support ideation processes. It was referred to during many of the feedback sessions, simply as 'Empathic Design'. This process was considered favourably as participants stated that it was useful in generating ideas and getting designers in the right frame of mind for understanding customers. It was noted that this process provided 'touching points' for discussion, debate and fuelled the flow of ideas.

"It's very difficult to criticise when we can actually see the points that are being made...after all we trade in a visual language". (ID-COMP-11).

Feedback became significantly more positive, and constructive when considering the communication of design responses to audiences outside the project team.

“Normally, we have real trouble convincing even project champions that our ideas are a goer, but using visual customer imagery, its’ so much easier, the arguments simply don’t exist any more and our ideas are much better understood”. (ID-COMP 10).

One significant finding from this aspect of the main study, has been that the rejection of the design responses has not led to the rejection of the design concept.

“I think this gives us a second chance... if I present something that no one likes, it gets canned, but this was interesting... they slated the design, but understood the idea and reckoned it should go forward – that’s never happened before”. (ID-COMP 9).

Participants used ‘Empathic Design’ as a vehicle to support ideation and used customer and customer understanding in the same way as they use magazines such as Blueprint and Design Week.

“We can dip in to this, we don’t have to trawl through a report”. (ID-STU3).

It was noted by many participants that no single point necessarily signalled their acceptance of a shift in communication, but the cumulative effect of a change in ideation emphasis coupled with a change in communication emphasis did contribute to the usefulness of ‘Empathic Design’. The researcher was able to characterise the change in emphasis in terms of transferable language that is accepted across multidisciplinary project team members. A transferable visual language to communicate customer data and design responses actively involves multiple stakeholders in this process and one statement delivered by a design participant captures precisely the benefit of such a shift.

“They don’t understand what we do, they don’t really know anything about design, but now they can see why we do it... we can’t put a business case, but this goes a long way to building a bridge”. (ID-COMP 12).

The feedback during this aspect of the main study confirmed that customer data provides an important catalyst for communication between project team members and can contribute to the ideation process. The key areas of feedback during this aspect of the main study, demonstrate the importance of shifting the emphasis of communication from artefact; that is physical design response to concept, that is the story and the supporting data creates a communicable platform for breakthrough innovations. Direct

customer data in the form of photographs and video are able to transfer the richness of data available to the design team to support the communication of its application in the ideation process. In addition, providing detailed, specific incidents and cases add credibility to concept presentations. These findings therefore prove hypothesis 2 within this aspect of the main study.

Hypothesis 2: Communication shift: Artefact to concept; maximising impact on customers: Organising stimulus for ideation and concept development facilitates the drive for 'breakthrough' innovations:

The findings presented in this section in relation to hypothesis 2, have also contributed to a clearer understanding of what is considered 'relevant' information by industrial designers. Particularly when considering how information can be translated into a language that can be used by designers and communicated to external audiences. It also identifies that, new levels of customer information need to be generated to support industrial designers ideation and communication processes. By identifying how industrial designers used this aspect of the 'Empathic Design' prototype a number of characterisations could be identified in the industrial designers processes. In summary:

- Examples of connections between ideas and customer experiences
- Examples of transferable customer activities
- Cross-industry findings that can be applied
- Shift in emphasis that can be characterised by the contextualisation of design responses in terms of customer data
- Communicable product selection driven by customer data
- Understanding of the relationships between design responses in terms of customer experiences

The reader should note at this point that the above characterisations drawn from this study were the result of the practices of industrial design teams rather than solely from individual industrial designers.

Most of these characterisations were expected by the researcher though there is one notable exception: Communicable product selection was not a characteristic that emerged during the exploratory pilot study, and yet was recognised by the participants as a critical attribute when considering such an approach. Whilst, communicating customer has been recognised as delivering communicable and robust support for design responses, the

facilitation of product selection in these terms is an unusual and unexpected characteristic. This characteristic of customer data communication between and beyond design teams could contribute heavily to the indication that hypothesis 2 is correct.

6.6 Hypothesis 3: 'Empathic Design' methodology needs to be designed to integrate naturally into daily practise of ideation and concept development (early stages of industrial Design) to complement industrial designers dynamic way of working

### 6.6.1 Brief

This aspect of the main study proposes that customer understanding methodologies should compliment the culture of design. It stated that customer data needed to be presented through a highly visual interface. The prototype 'Empathic Design' methodology, has been influenced by Bakker (1995) who recognises that design information should be presented visually, and Sherwin (2000) who recognises the importance of capturing the richness of data using visual cases and examples. These findings combined with observations and experience of industrial design culture contributed to the design of the prototype methodology and the provision of visual maps.

This aspect of the main study was conducted as a 'live' project in collaboration with Samsung Design Europe, Seymour Powell Futures and industrial design students the University of Hertfordshire. The researchers role within this aspect of the main study and following the construction of the study was as an observer.

This project was constructed as a 'live' innovation project designed to break the trend toward the irrelevant by allowing designers to 'get into customers heads', to observe what customers actually do rather than what they say they do, in order to uncover their real needs and desires – we're not asking them to tell us which colour and shape they like.

Through the processes of direct observation, mapping of customer needs and intense 'brainstorming' during ideation processes the objective is to produce a number of customer scenarios and product concepts. The objective of this 'live' project was to generate opportunities for Samsung Design Europe in the short to mid term. Samsung hoped that this would evolve new product typologies.

## Home appliance project > march 2002

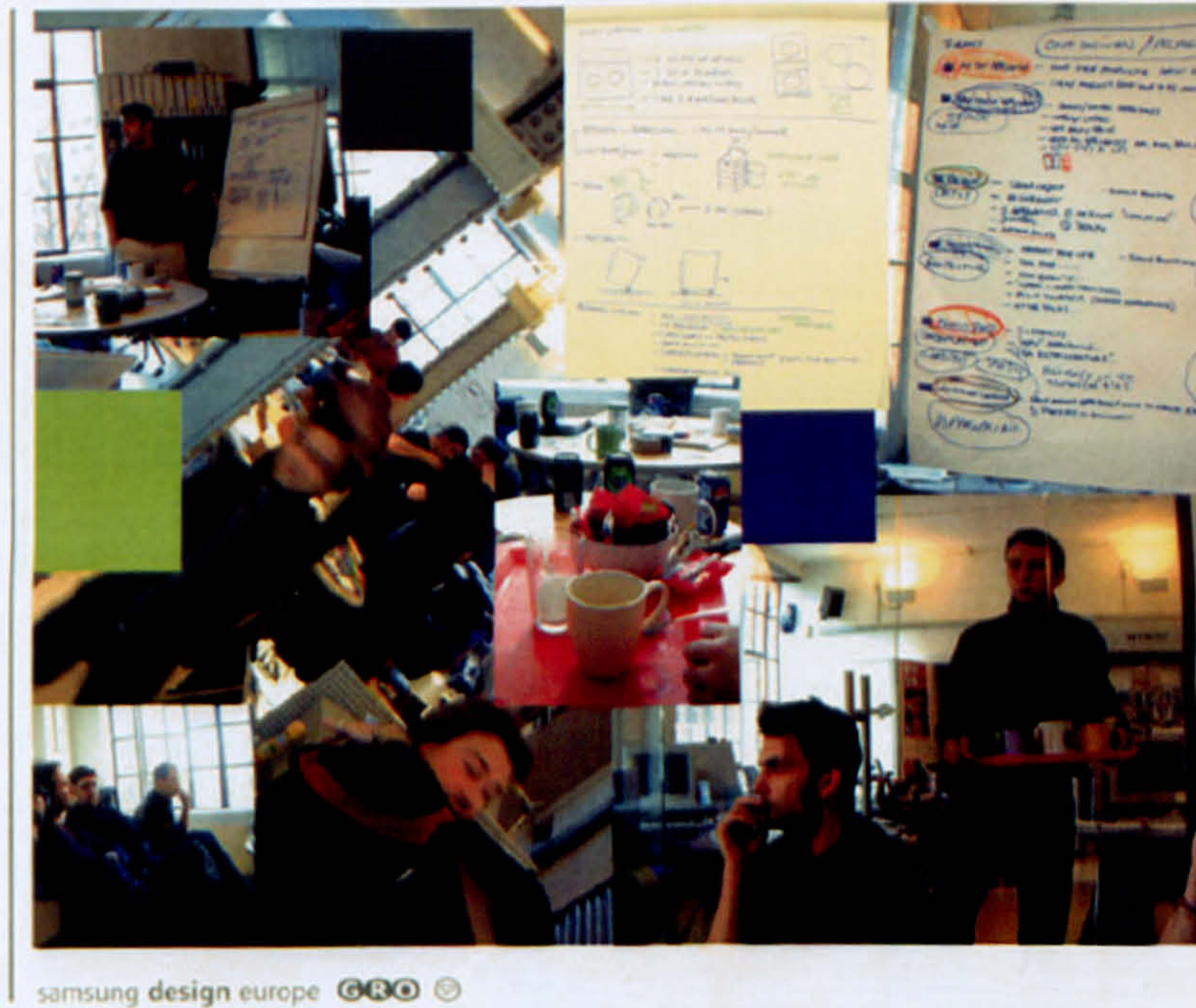


Figure 6-6A: illustrative example of 'live' project activity (SDE)

### 6.6.2 Process

This aspect of the main study excluded designers with specific expertise in home appliance engineering in order to engender "raw, naïve creativity" and develop opportunities for specific niche markets. Design outcomes would be in the form of product concepts, as with other aspects of this main study.

Designers were encouraged to work in teams in order to conduct direct observation. Two design teams worked in parallel with identical briefs and the researcher took care to ensure that guidance was consistent. Following three days of intense observation with respect to key words to define specific areas of interest:

- My first Appliance
- Apartment appliances
- Family sized
- Premium
- Professional
- Other locations (appliance to furniture)

Limitations to this process centred on the primary driving personalities of one of the design teams (Seymour Powell), who are



regarded as current industry 'best practitioners' of direct customer observation driven ideation processes. To alleviate this issue the researcher restricted their involvement to only one of the design teams involved in the innovation project.

Figures 6-6 and 6-6-2 illustrate real-time activity and output during an intense ideation process. The output of this project is included in its entirety in appendix F. The illustrations shown represent an aspect of the project that was designed to generate a large number of ideas in relation to customer needs and aspirations. This agenda created a suitable opportunity to test the alignment of the developed Empathic Design methodology to industrial design practice. It is important to note that the commercial nature of this activity placed considerable stress on the participants involved and post-activity comments indicated that if the developed Empathic Design methodology had not aligned with the actions or individual processes of the participants then it would have been necessary to disregard its use.

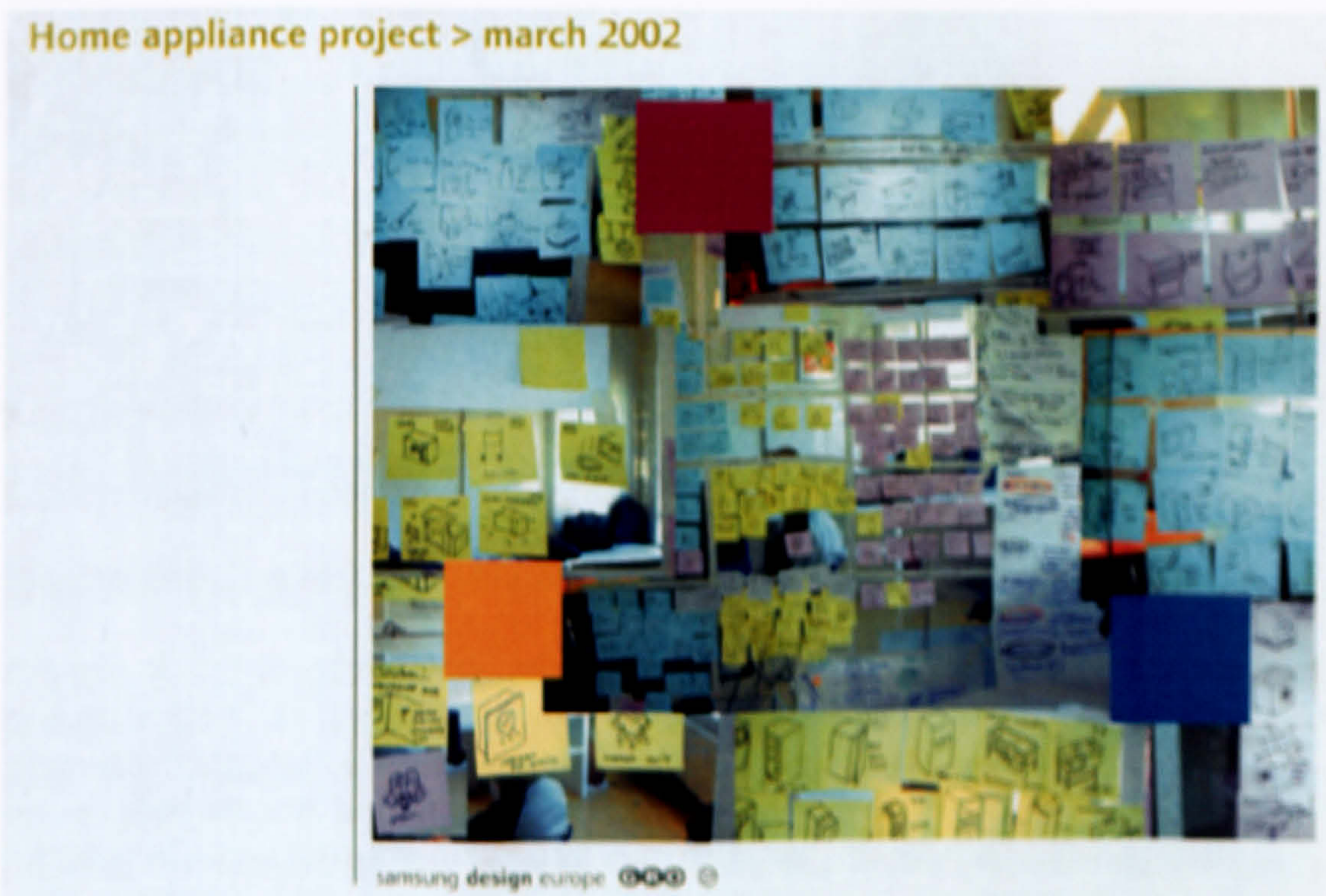


Figure 6-6B: example mapping and concept idea process (SDE)

Following direct observation (used in this project as the primary vehicle for direct customer understanding), intense brainstorming took place over several days. Approximately 120 concepts were generated to fit into the above scenarios. (See figure 6-6B)

The team observed by the researcher had the benefit of scenario and delivery maps described in chapter 4. Both teams integrated following initial brainstorming to filter product concept ideas. And 30 concepts would be filtered for presentation.

Concept selection was based on the following filters:

- Is it Appropriate?
- Is it Samsung?
- No blue Sky
- 1-5 years
- New Business area

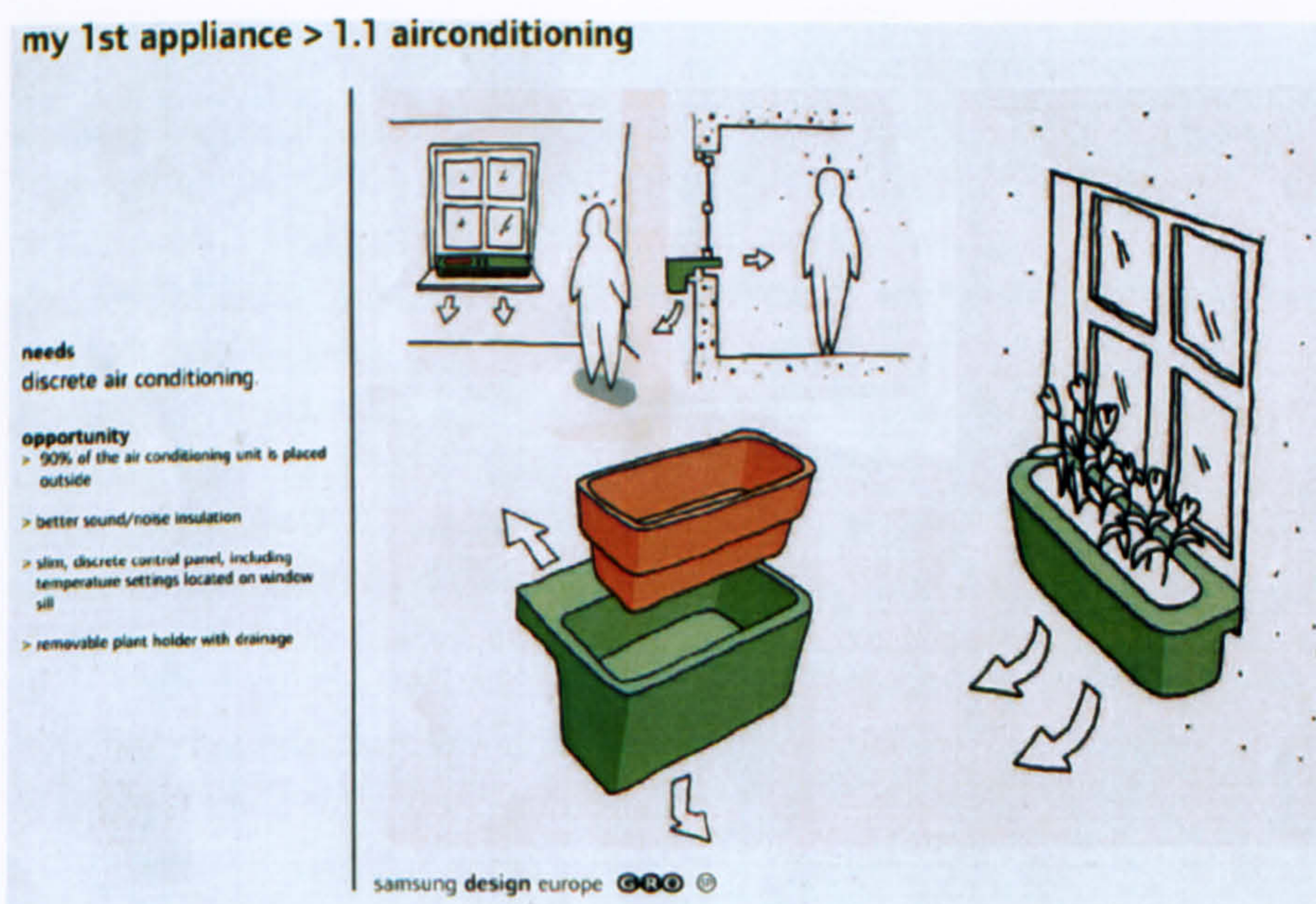


Figure 6-6C: example concept design response (SDE)

Figure 6-6C illustrates a concept proposal for discreet domestic air conditioning. It was the result of the observed connections between planted 'natural' environments and relaxed customers. Connections were also made between these environments and current locations where air-conditioning would be desired. Since air-conditioning is designed to cool and relax its users the semantics of the object contradict that objective. Though the product is not a radical one the feelings it is designed to evoke differ greatly from the conventional paradigm. It is also likely to differ from current market offerings.

Full concept design response summary can be found in appendix F.

### 6.6.3 Findings

The importance of visual interfaces was highlighted on a large number of occasions, and it was considered critical that individual tools engaged with industrial designers ways of working.

“I guess video footage has been one of the most important things, otherwise, someone needs to fill in the blanks”. (IDS-CON 1)

Visual interfaces during ideation processes were considered influential in maintaining the flow of ideas, and keeping the focus on customer activities.

The researcher was able to uncover a significant, through the observation of the other design team, who were not provided with scenario, or delivery maps, considered the nature and the characteristics of the concept proposals. Those designers who were presented with scenario oriented working methods and maps, were able to visualise concepts appropriate to broader customer experiences and were not limited to product interactions. It was widely recognised that those designers that engaged without the full prototype methodology, generated ideas, that were not driven by customer understanding and were significantly centred around products and product interactions. Often these combined tasks but never, during this study ventured beyond activities on the delivery map.

“Pictures are better than words – moving pictures are even better” (IDS-CON 2)

“If you made this into a textbook, and gave me an index and a glossary, I couldn’t use it. It fragments the process – what we’re using here is dynamic, it doesn’t tell us what to do and we can use it how we like”. (IDS-COM13)

It was also recognised that industrial design is not a linear process, nor is it prescriptive. It has been noted across the four aspects of the main study that designers responded to the prototype ‘Empathic Design’ methodology’s ability to create ‘touch points’ for designers to share information, insights and contribute to the flow of ideas during both customer understanding and ideation processes.

“What’s really useful, is that this harmonises rather than fragments the process - particularly when filtering ideas for appropriateness... it’s better than an educated guess”. (IDS COM 13).

The findings presented within this aspect are considering the ability of the Empathic Design methodology to stimulate design activity during both customer understanding and ideation processes. It characterises the importance of visual media to inspire, motivate and communicate design issues. It's acceptance as a mechanism for integrating customer understanding into ideation process proves that the principle of the prototype 'Empathic Design' methodology integrates with existing and emerging processes of industrial design. It is more interesting to note that this visual mechanism for integrating, customer understanding data, scenarios and design responses has not been applied to industrial design tools.

The dynamic nature of designers is key to the acceptance and access to the 'Empathic Design' methodology. Designers pick things up and run with them, (observed during the exploratory pilot Study). Feedback confirmed that the prototype methodology allowed them to do this and didn't slow them down.

"it's flexible! That's it! I can use it as and how I need" (IDS-CON1)

Using these methods was highly regarded by all participants for its ability to keep things rolling, one unexpected finding was the speed at which these methods weed out irrelevant or inappropriate information or connections.

6.7 To conclude Hypothesis 3: 'Empathic Design' methodology needs to be designed to integrate naturally into daily practice of ideation and concept development (early stages of industrial Design) to complement industrial designers dynamic way of working

There are a number of indicators that have emerged to support this hypothesis:

- Designers actually used it, applied it in real commercial situations with high level of intensity (120 Concepts)
- Designers supported its use and have continued to use it
- Participant noted it formalised their ideation process without having to radically adjust their intuitive working practice
- It facilitated the sharing of data during team activities

Though these don't prove hypothesis 3, they do provide strong support for it. Further research would need to be conducted to uncover more specifically those changes to intuitive practices required by industrial designers to adopt an Empathic Design approach.

## 6.8 Hypothesis 4: understanding the connection between underlying needs and 'Ideation' facilitates the drive for breakthrough innovations

### 6.8.1 Transferring Customer Data to Ideation Processes

This section is concerned with the transfer between customer understanding and ideation processes. Hypothesis 2 presents an argument that the methods employed within an 'Empathic Design' methodology need to provide opportunity for customer data to stimulate and inform the ideation and that these two streams need to be intrinsically linked so industrial designers can focus ideation upon the latent and tacit needs of customers. This theory has evolved from the findings that emerged through the exploratory pilot study that showed that industrial designers frequently visited artefacts as means of stimulating new ideas, but customer data required a "leap of faith" (UH-pdl-2) in order to generate products that identify with customer scenarios rather than product interactions. Customer data is often dismissed as too remote from concept design responses.

### 6.8.2 Mapping customer understanding (delivery maps)

The aim of the feedback obtained from design participants in the Main Study was to identify whether information gleaned from 'customer understanding processes' was a prerequisite for the undertaking of a customer driven ideation process for industrial designers. However, during the development of the prototype 'Empathic Design' methodology, the researcher had limited understanding of industrial designers' use of customer driven stimulus and direct 'customer understanding' carried out by industrial designers. This is not a process identified in empathic design literature.

In response to this, methods were constructed within the prototype 'Empathic Design' methodology to present 'customer understanding' in terms of specific scenarios, activities and incidents to facilitate the translation from 'customer understanding' to 'ideation'. Here the stimuli is simplified as key insights and translated into a language appropriate to industrial design practise. (as identified through the exploratory pilot study). It is important that the reader recognises within this section that the methods proposed in the 'Empathic Design' methodology for presenting and linking 'customer understanding' directly with 'ideation processes' with a view to speaking 'breakthrough' innovations and maintaining customer

drivers in an 'ideation' process differed from other practises of Empathic Design. Although recognised as methods requiring development, as it did not provide explicit means for identifying new opportunities for 'customer understanding' processes. It was considered a considerable advance, given the absence of understanding as to how to integrate 'customer understanding' and 'ideation' processes. The researcher presented a prototype solution in order to encourage participants to be more explicit as to the customer information required to inform the ideation process. In general, the feedback from participants indicated that the methods provided were well received and widely adopted for further development:

"It reduces the assumptions we have to make when deciding which ideas we go with..." (Ids-stu-14) referring to concept development.

"We just did it before, but didn't know exactly how. This helps us tell other people why we did it". (Iss-com-1)

"This helps support groups of small innovations that can make big changes... we know why they have a significant impact". (Iss-com-2)

### 6.8.3 Supporting Idea generation

The 'Empathic Design' prototype methodology development highlighted ideation activities as key to maintaining 'customer understanding' as primary drivers for innovation. It was felt largely by industrial design participants that specific creativity tools or methods for generating ideas were not necessary. Requirements were much more aligned to support and guide the use of 'customer understanding' in the ideation. In short using customer data as stimulus.

"we need a way of drawing upon examples of customer activities quickly, this doesn't really give us that. What this does is allows us to link ideas to each other" (Ids-con-1)

"what this does do, is force us to ask new questions.. it actually helps". (Iss-com-2).

This reaction, when considered retrospectively, is not surprising. Ideation, is an inherent part on an industrial design process. Visual links between ideas and relationships to customer activities focus the ideation process upon new questions. These new idea groups are now clustered around specific customer activities, highlighting

questions and opportunities to support holistic solutions with customer driven stimulus; 'customer understanding'.

#### 6.8.4 Combining 'Customer Understanding' and 'Ideation' Processes

The feedback from designers illustrated that there was a need to link 'customer understanding' with 'ideation' to ensure that the ideas reflected the observed problems. It was felt that focus and direction could be lost without guidance. However, it was also recognised that designers require this explicit link for themselves to mesh exactly with their ideation and concept development processes. The connections between customer activities and scenarios and product innovations were seen as critical if the requirement was for 'high impact' products.

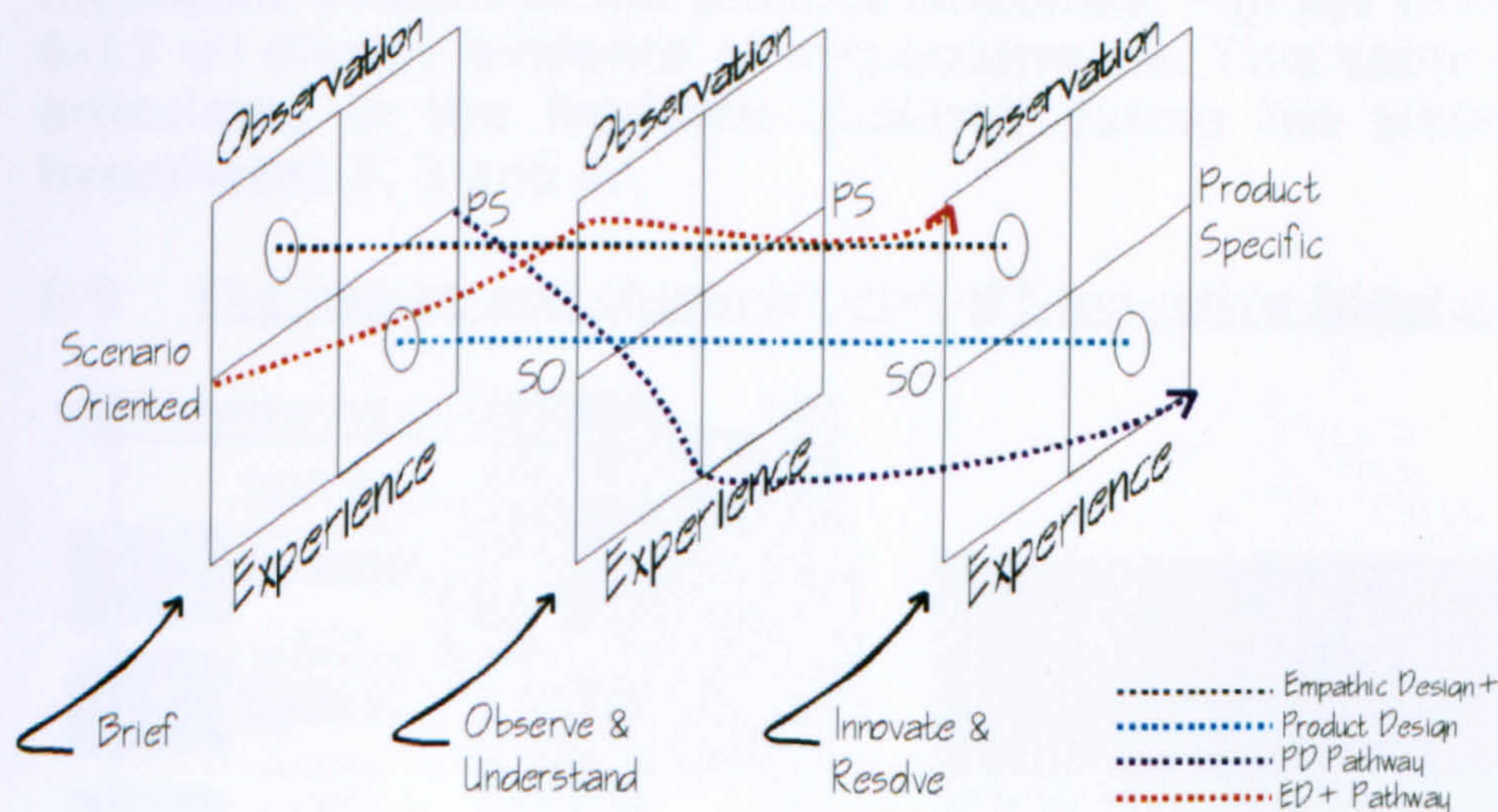


Figure 6-9 :A shift in industrial design pathways (Barrett, 2002)

"['Customer understanding' and 'ideation' processes]... need to be linked visually so that our creative focus isn't lost looking for links between people and ideas. I guess, it's difficult to articulate complex relationships... we work well when we can see things. If it was a mass of information, we'd just pick aspects that we found interesting, but we wouldn't necessarily know why. We're designers, we need visual stimulation. I was actually intrigued by using people instead of existing products as inspiration... it didn't altogether work though - I still need a way of visualising my ideas, these visuals have to come from somewhere. That said, it's more radical than I'd ever have tried before. I suppose I'm more confident in presenting it when I can justify where it's come from." (Ids-com-1)

"I can think about my ideas completely differently now. I used this to support ideas that I'd never have presented before. I'd never have got it through".

#### 6.8.5 'Delivering' Detail

Providing an explicit link between 'customer understanding' and 'ideation processes' was indicated in a number of activities during the course of this study. Significantly, a number of participants articulated that real came later in the ideation and concept development processes. "when we were thinking about how to detail the proposal was when some of the things we found were really useful" (Ids-Stu-7).

This delivery of detail can be characterised through the semantic messages evident in the product outcomes. Figures 6-11, 6-12 and 6-13 all display evidence of this occurrence. This same evidence is articulated in the feedback obtained during the projects testing hypotheses 2, 3 and 4.

#### 6.9 The nature and characteristic of Innovative Ideation



Figure 6-11: RSA Project outcome 2002 (Dean, S. and Cook, N.) London transport vehicle designed for customer experience.

#### 6.10 Conclusions

This chapter has introduced the main study and presented the hypothesis testing. The four aspects of the main study have demonstrated the wealth and richness of information obtained from all the participants has tested and challenged four hypotheses. Each



hypothesis has been shown to be true within the context of this study.

In addition, this prototype 'Empathic Design' methodology has proved to be a successful mechanism by which to gather feedback from participants. The construction of 'live' projects has maintained the industrial grounding and naturalistic representations of industrial design application of this methodology. These mechanisms provided an excellent platform for feedback sessions and actively encouraged designers to voice suggestions, and criticisms. The researcher was keen throughout this study to maintain industrial realism and balance this with intimate access to the dynamic working (often highly pressurised) of industrial design teams. A sense of involvement amongst the participants was carried through this study as the methodology developed.



Figure 6-12: D&AD NESTA Winner 2003 ('Empathic Design' methodology employed to deliver 'breakthrough innovation').



Figure 6-13: Indoor washing line and wardrobe: celebrates clothes and uses them as part of interior design.

In Conclusion to Hypothesis 4: understanding the connection between underlying needs and 'Ideation' facilitates the drive for breakthrough innovations

Key characterisations of the design output as well as design process have supported hypothesis 4. there are:

- Semantic messages displayed in designed output reflect customer understanding (also seen in Hyp. 3)
- Details of designed output informed by customer data
- Product output presented as part of a customer experience.

Whilst these indicators do not prove Hypothesis , they do contribute when considered alongside the feedback gained during this study.

## 6.11 Main Study Participants and their response to the hypotheses

Code	Description	Agree with Hypothesis 1	Agree with Hypothesis 2	Agree with Hypothesis 3	Agree with Hypothesis 4
lds-stu-1	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief written to reappraise the design of a specific product. (See Appendix C)	Yes	Yes	Yes	Can't Comment
lds-stu-2	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief written to reappraise the design of a specific product. (See Appendix C)	Yes	Yes	Yes	Not Sure
lds-stu-3	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief written to reappraise the design of a specific product. (See Appendix C)	not sure	Yes	Yes	Not Sure
lds-stu-4	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief written to reappraise the design of a specific product. (See Appendix C)	Yes	Yes	Yes	Not Sure
lds-stu-5	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief written to reappraise the design of a specific product. (See Appendix C)	Yes	Yes	Yes	Yes
lds-stu-6	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief written to reappraise the design of a specific product. (See Appendix C)	No	Yes	Yes	Yes
lds-stu-7	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief written to reappraise the design of a specific product. (See Appendix C)	Yes	Yes	Yes	Yes
lds-stu-8	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief written to reappraise the design of a specific product. (See Appendix C)	Yes	Yes	Yes	Yes
lds-stu-9	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief written to reappraise the design of a specific product. (See Appendix C)	Yes	Yes	Yes	Yes
lds-stu-10	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief written to reappraise the design of a specific product. (See Appendix C)	Yes	Yes	Yes	Yes
lds-stu-11	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief written to reappraise the design of a specific product. (See Appendix C)	Yes	Yes	Yes	Not Sure
lds-stu-12	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief written to reappraise the design of a specific product. (See Appendix C)	No	Yes	Yes	Yes
lds-stu-13	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief written to reappraise the design of a specific product. (See Appendix C)	not sure	Yes	Yes	Yes

## 6.12 Summary of descriptive study.

To summarise, through the testing of four hypotheses it has been seen that industrial designers involved in the earliest stages of the industrial design process; that is customer understanding and ideation need a methodology that integrates with current industrial design practise, and connect customer understanding and ideation processes in a way that allows designers to use and communicate the real intellectual worth of the customer understanding that uncovers those latent and tacit needs. The findings suggest that without a methodology of this nature industrial designers do not have the necessary tools to integrate customers latent and tacit needs into ideation processes in a way that supports and communicated appropriate 'breakthrough' innovations.

## 7.0 Conclusions and Recommendations

### 7.1 Chapter Summary

The aim of this research has been to identify a better understanding of the needs of industrial designers involved in the earliest stages of new product development. Specifically those industrial designers involved in customer understanding and ideation processes. It has also been the aim of this research study to understand the impact of an 'Empathic Design' methodology through the development of empathic design. This has been achieved and the findings have been used to characterise the impact of 'Empathic Design' on those early stages of new product development undertaken by industrial designers. It has also been possible to develop a better understanding of the relationship between industrial design and Empathic Design.

### 7.2 Meeting the research aims and objectives

The aim of this study was stated as follows:

- To explore and characterise the integration of customer understanding into the earliest stages of an industrial design process
- To characterise the relationship between Empathic Design and the early stages of the process of industrial designers

In response to these objectives, this study aimed to provide an understanding of the attributes required of an 'empathic Design' methodology intended to support the integration of customer understanding in order to drive the innovation and ideation processes within an industrial design context. This study also sought to characterise the impact of empathic design upon the earliest stages of an industrial design process. Prototype 'Empathic Design' tools were developed with this in mind. This developed 'Empathic Design' methodology aimed to design focused customer understanding as a methodology for using customer data to drive the innovation process within an industrial design context. The development therefore had to be sympathetic to industrial design culture. The early stages of industrial design processes were interpreted here as those activities conducted by an industrial design department (product planners and advanced product teams) and as the pre-concept and concept stages of product development. The purpose of studying the early stages was in exploring the more innovative practises of customer driven product development. The early stages of industrial design process' were identified as critical

to this. For this reason, both industrial design and empathic design were considered key themes for the research aims.

By conducting an in-depth literature review, an empirically based Exploratory Pilot Study and a Main Study in which a prototype methodology was tested, the objectives of this research have been satisfied.

Whilst meeting these objectives, the research also identified a better understanding of the role of industrial designers in understanding customers.

### 7.3 Research findings and conclusions

A number of conclusions have been drawn from this research project. These are summarised below:

- Tools that have been developed for other disciplines are not necessarily suitable for industrial designers involved in the early staged of new product development as each discipline engages differently with customer data,
- Re-orientating design stimulus towards customer data can present greater diversity, provided industrial designers can engage with customer data.
- The provision of useful customer data is key to the success of an empathic design methodology, but it needs to be presented in a way that supports current practises of industrial design
- Providing guidance tools within an empathic design methodology contributes to the connection required between customer understanding and ideation processes.
- The removal of product inferences from the earliest stages of an industrial process, presents difficulties when the industrial design process is driven towards physical design responses
- Empathic design can provide a language catalyst between industrial designers and external (non design) audiences as it promotes direct customer data to support ideation and communication processes.
- Industrial design focused methods of customer understanding need to ensure they are focused and developed in sympathy with the culture of industrial design. This means that the service that empathic design provides needs to be presented in a

language that is visual and appropriate to the practises of industrial design.

- The currently advocated approach of Empathic design does allow industrial designers to determine the latent and tacit needs of customers, but it does not encourage designers to respond to those needs.
- The currently advocated approach to Empathic Design does not encourage industrial designers to move beyond externally observable customer actions and interactions.
- Empathic design can complement artefact driven stimulation that is prevalent during the development of product concept design responses.
- The latent and tacit needs of customer can be met through the delivery of new experiences facilitated by an orientation towards customer scenarios.
- Reframing design briefs in terms of customer experiences rather than artefacts, encourages and facilitates increased diversity during ideation processes.

#### 7.4 Success and limitations of the 'Empathic Design; methodology

The development of a methodology is likely to raise questions with regards to measuring success. The success of the prototype methodology developed during this research project did not rely on the number of new innovations conceived, or the number of innovations allowed to progress through the development process. Instead the success of this methodology lay in its ability to further the integration of customer understanding into the ideation processes of industrial design, and a deeper understanding of the support mechanisms industrial designers require to support customer driven ideation. This has been achieved.

In addition to this, the tool has been successful in other ways:

- During the testing phases a wide range of industrial designers used the methodology. They all provided valuable and considered feedback for the study and they were supportive of the methodological concept and saw value in it's application
- The fact that designers used the methodology could be considered success in itself. The acceptance of the

methodology and the change in approach it promotes was widely considered valuable to industrial designers. It was felt that this provided a good indication of the level to which the Empathic design methodology harmonised with industrial design practise.

- Finally success has further been achieved in improved understanding of customers experiences amongst industrial designers, the methodology demonstrated that customer understanding is becoming a more pressing issue within the design agenda.

Three limitations of the 'Empathic Design' methodology were identified:

- The methodology was a prototype
- The methodology underwent continuous revision
- The methodology require a high level of initial time investment

### 7.5 Summary of Findings

- •Tools that have been developed for other disciplines are not necessarily suitable for industrial designers involved in the early staged of new product development as each discipline engages differently with customer data,
- •Re-orientating design stimulus towards customer data can present greater diversity, provided industrial designers can engage with customer data.
- •The provision of useful customer data is key to the success of an empathic design methodology, but it needs to be presented in a way that supports current practises of industrial design
- •Providing guidance tools within an empathic design methodology contributes to the connection required between customer understanding and ideation processes.
- •The removal of product inferences from the earliest stages of an industrial process, presents difficulties when the industrial design process is driven towards physical design responses
- Empathic design can provide a language catalyst between industrial designers and external (non design) audiences as it promotes direct customer data to support ideation and communication processes.
- Industrial design focused methods of customer understanding need to ensure they are focused and developed in sympathy with the culture of industrial design. This means that the service that empathic design provides needs to be presented



in a language that is visual and appropriate to the practises of industrial design.

- The currently advocated approach of Empathic design does allow industrial designers to determine the latent and tacit needs of customers, but it does not encourage designers to respond to those needs.
- The currently advocated approach to Empathic Design does not encourage industrial designers to move beyond externally observable customer actions and interactions.
- Empathic design can complement artefact driven stimulation that is prevalent during the development of product concept design responses.
- The latent and tacit needs of customer can be met through the delivery of new experiences facilitated by an orientation towards customer scenarios.
- Reframing design briefs in terms of customer experiences rather than artefacts, encourages and facilitates increased diversity during ideation processes.

## 7.6 Generalisability of the research findings

As the scope of this research has been generalised across industry sectors that include industrial design, the findings have the potential to be of value to any industry where industrial designers are employed in the capacity of product and experience designers.

The literature showed that industrial designers do not make significant use of structured tools and methods. In recognition of this, it is felt that the more general findings from this thesis

## 7.7 Contribution to Knowledge

The academic contribution to knowledge presented in this research presented in this thesis has been to provide an understanding of the support needs for industrial designers that are required to undertake practises of customer understanding and integrate that customer understanding in to the earliest stages of new product development including ideation processes.

These requirements have been developed through the exploration and development of an Empathic Design methodology in which future customer understanding, and ideation methods can be

housed. This methodology represents a 'blueprint' rather than a prescriptive methodology the principles of which can be combined in order to develop new tools and methods, which are more appropriate to the needs of industrial designers.

In addition to this, the way in which the research was carried out has also provided a contribution to knowledge. A considered, and 'imperfect' prototype with high level of originality was developed using the empirical findings of the exploratory pilot study. This allowed an understanding of the needs of industrial designers involved in customer understanding and ideation to be built and refined. It was from this that the industrially grounded aspects of the main study were developed to further develop an understanding of the nuances of industrial design practised empathic design. Novelty has been demonstrated through the act of applying design principles to the development of methods of integrating customer understanding and ideation. This includes identifying industrial designers as managers of this process and the development of this methodology as a mechanism for integrating the voice of the customer and empathic design into an industrial design process.

Finally this research has contributed to a more detailed understanding of the role of industrial designers in the pre-concept stages of new product development. It has been seen that designers carry adopt empathic design in much the same way as they conduct industrial design. This is something that had not previously been recognised within design literature.

Further contributions to knowledge centre around the reorientation of customer data in terms of scenarios rather than product interactions in order to drive breakthrough innovations and its ability to share data across industrial sectors.

To summarise, the work presented in this theses has provided a basis upon which future customer focused design methods can be developed through a more detailed understanding of the impact of empathic design upon the earliest stages of new product development. It has furthered the understanding of designers needs when undertaking these roles within the design process. This thesis has contributed to design theory by advancing the knowledge and understanding of the interconnection between customer understanding, empathic design and industrial design.

## 7.8 Summary of Contributions to Knowledge

- •Current Literature reveals little academic research into the Integration of customer data into the earliest stages of industrial design processes
- •Little research into application of Empathic Design by industrial designers.
- •Deeper understanding of the integration of Customer Data into the earliest stages of an industrial design process
- •Developed Empathic Design methodology to facilitate the use of customer data to drive ideation processes in an industrial design context.
- •Novel research into the use of Empathic Design methods in an industrial design ideation process.

## 7.9 Recommendations for Future Research

This section makes some recommendations for further work this has emerged out of this research study.

- An obvious development of this study would be to propose the development of a holistic framework that can facilitate the development of customer understanding tools and techniques.
- The addition of more case examples
- Deeper understanding of the information that contributes to the connections between customer scenarios and product development.

At the time of this thesis submission the work presented in this thesis has formed the basis of a research proposal to further develop the 'Empathic Design' methodology and to identify and apply principles appropriate to 'working practises' that is the work transaction. The intention being that a framework can be developed in conjunction with a number of industrial collaborators where customer understanding can be shared across industrial sectors proposed by the novel organisation of customer data in terms of scenarios proposed in this thesis.

A second, more long term area for development would be to carry out a follow-up study to see how designers used and developed their own tools based on the principles of empathic design.

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Introduction

This appendix provides greater detail with specific regard to the individuals that were interviewed and observed during this research project. Each participant has been attributed a code, which (where appropriate) has been used within the main body of the thesis for referencing purposes. It is important to note that the quotes used within the main body of the thesis are intended to be illustrative and as such are representative of the comments made by a number of participants. There are instances where one participant is cited more frequently. This recognises that some participants are more articulate, and comments are likely to be representative of a number of participants. It is likely that one participant has articulated or translated a common point more succinctly or precisely.

Exploratory Pilot Study

During the exploratory pilot study, information was gathered from a wide range of sources, via a number of qualitative data collection techniques. These are summarised in the research methodology chapter. The aim of this appendix is to provide further detail as to the key individual participants in the project and interview aspects of the exploratory pilot study. This is designed to extend clarification with regard to the evidence trail for this research study. Tables A-1 and A-2 provide generic codes that were applied to participants. Table A-3 applies these codes to individual participants and assigns them individual numbers where necessary. Table A-3 also provides details regarding the nature of data collection methods used and the date(s) they were carried out. This coding is used within the main body of the thesis (where appropriate) to reference any specific quotations.

Nissan Senior Design Engineer	Nis-sde
Nissan Design Engineer	Nis-des
MIRA Researcher	Mir-res
Design Council UK Essential Customer Intimacy Participant	Des-eci
NOP Automotive Director of Research	Nop-dor
University of Hertfordshire Product Design Programme Staff	Uh-pdl
University of Hertfordshire Product Design Programme Student	Uh-pds

Table A-1 Coding for project and case participants - exploratory pilot study

Industrial Design consultancies in UK	lds-con
Industrial Design Education specialist in UK	lds-edu
NOP Automotive Director of Research	Mrs-nop
Advanced Product Group - Ford	Apg-frd
Industrial Designer - In house, UK	lds-inh

Table A-2 Coding for qualitative interview participants - exploratory pilot study

Appendix A: **Data sources for the Exploratory Study and Main Study**

Code	Description	Date	Interview Type
Nis-sde	Senior Design Engineer - Quality planning & marketability. Charged with Attractive Perceived Quality. Part of CUPID project. Charged with ensuring customer needs enter vehicle programmes	Jan 1999 - Feb 2002	Extensive number of semi-structured and unstructured interviews at Nissans Technical Centre-Europe. Participant in a significant number of CUPID workshops.
Mir-Res-1	Senior Researcher - Motor Industries Research Association. Project partner in CUPID project. Charged with disseminating findings across the automotove sector.	Jan 1999 - Feb 2002	Extensive number of semi-structured and unstructured interviews at MIRA - Nuneaton. Participant in a significant number of CUPID workshops.
Mir-Res-2	Senior Researcher - Motor Industries Research Association. Project partner in CUPID project. Charged with disseminating findings across the automotove sector.	Jan 1999 - Feb 2002	Extensive number of semi-structured and unstructured interviews at MIRA - Nuneaton. Participant in a significant number of CUPID workshops.
Nop-dor	Associate Director - National Opinion Pole Automotive Division. Responsible for qualitative consumer research in automotove sector. Largest Automotive consumer research agency in the UK.	Jan 1999 - Feb 2000	Three semi-structured interviews and a number of unstructured interviews over a period of time.
UH-pdl-1	Programme leader - Product Design Undergraduate programme at University of Hertfordshire. Responsible for design thinking and methods taught at undergraduate level	Sept 1999 - Feb 2002	extensive number of semi-structured and unstructured interviews at University of Hertfordshire. Partner in student project for exploratory pilot study
UH-pdl-2	Programme tutor - Product Design Undergraduate programme at University of Hertfordshire. Responsible for design thinking and methods taught at undergraduate level	Sept 1999 - Feb 2002	extensive number of semi-structured and unstructured interviews at University of Hertfordshire. Partner in student project for exploratory pilot study
UH-pds-1	Product Design Student: Degree level 2. University of Hertfordshire	Mar 2001 - May 2001	extensive number of semi-structured and unstructured interviews at University of Hertfordshire. Exploratory pilot study project participant
UH-pds-2	Product Design Student: Degree level 2. University of Hertfordshire	Mar 2001 - May 2001	extensive number of semi-structured and unstructured interviews at University of Hertfordshire. Exploratory pilot study project participant
UH-pds-3	Product Design Student: Degree level 2. University of Hertfordshire	Mar 2001 - May 2001	extensive number of semi-structured and unstructured interviews at University of Hertfordshire. Exploratory pilot study project participant
UH-pds-4	Product Design Student: Degree level 2. University of Hertfordshire	Mar 2001 - May 2001	extensive number of semi-structured and unstructured interviews at University of Hertfordshire. Exploratory pilot study project participant

Appendix A: **Data sources for the Exploratory Study and Main Study**

UH-pds-5	Product Design Student: Degree level 2. University of Hertfordshire	Mar 2001 May 2001	- extensive number of semi-structured and unstructured interviews at University of Hertfordshire. Exploratory pilot study project participant
UH-pds-6	Product Design Student: Degree level 2. University of Hertfordshire	Mar 2001 May 2001	- extensive number of semi-structured and unstructured interviews at University of Hertfordshire. Exploratory pilot study project participant
UH-pds-7	Product Design Student: Degree level 2. University of Hertfordshire	Mar 2001 May 2001	- extensive number of semi-structured and unstructured interviews at University of Hertfordshire. Exploratory pilot study project participant
UH-pds-8	Product Design Student: Degree level 2. University of Hertfordshire	Mar 2001 May 2001	- extensive number of semi-structured and unstructured interviews at University of Hertfordshire. Exploratory pilot study project participant
Apg-frd-1	Ideation Specialist - Advanced Product Group, Ford. Responsible for integrating customer data into strategic and vehicle development programmes	Jan 2001 Feb 2002	- extensive number of semi-structured and unstructured interviews at Ford's Technical Centre, Dunton. On-site observations. All over eriod of time
Apg-frd-2	Ideation Specialist - Advanced Product Group, Ford. Responsible for integrating customer data into strategic and vehicle development programmes	Jan 2001 Feb 2002	- extensive number of semi-structured and unstructured interviews at Ford's Technical Centre, Dunton. On-site observations. All over eriod of time
Apg-frd-3	Senior Engineer - Advanced Product Group, Ford. Responsible for integrating customer data into strategic and vehicle development programmes	Jan 2001 Feb 2002	- extensive number of semi-structured and unstructured interviews at Ford's Technical Centre, Dunton. On-site observations. All over eriod of time
Apg-frd-4	Researcher - Advanced Product Group, Ford. Responsible for integrating customer data into strategic and vehicle development programmes	Jan 2001 Feb 2002	- extensive number of semi-structured and unstructured interviews at Ford's Technical Centre, Dunton. On-site observations. All over eriod of time
Ids-con-1	Director of Industrial Design Research. PDD, London	Sept 2000- Feb 2002	- extensive number of semi-structured and unstructured interviews over time at PDD. Participants in Essential Customer intimacy and Delight by Design.
Ids-con-2	Industrial Designer. PDD, London	Sept 2000- Feb 2002	- extensive number of semi-structured and unstructured interviews over time at PDD. Participants in Essential Customer intimacy and Delight by Design.
Ids-con-3	Industrial Designer. PDD, London	Sept 2000- Feb 2002	- extensive number of semi-structured and unstructured interviews over time at PDD. Participants in Essential Customer intimacy and Delight by Design.

Appendix A: **Data sources for the Exploratory Study and Main Study**

Ids-con-4	Human Factors Specialist - IDEO, London	Sept 2000 Feb- 2002	- extensive number of semi-structured and unstructured interviews over time at IDEO. Participants in Essential Customer intimacy
Ids-con-5	Senior Industrial Designer - IDEO, London	Sept 2000 Feb- 2002	- extensive number of semi-structured and unstructured interviews over time at IDEO. Participants in Essential Customer intimacy
Ids-con-6	Interface Designer - IDEO, London	Sept 2000 Feb- 2002	- extensive number of semi-structured and unstructured interviews over time at IDEO. Participants in Essential Customer intimacy
Des-eci-1	Graphic and Space Designer - The Finer Detail, Bedfordshire.	Sept 2000 Feb- 2001	- extensive number of semi-structured and unstructured interviews over time at the finer Detail. Participant in Delight by Design
Des-eci-2	Landscape Designer - Alfa Landscapes, Bedfordshire	Sep-00	Participant in Essential Customer intimacy
Des-eci-3	Interface Architect - AKQA - Branding, London	Sep-00	Participant in Essential Customer intimacy.
Des-eci-4	Design Researcher - Design research Centre, Brunel University.	Sep-00	Participant in Essential Customer intimacy
Des-eci-5	Marketing specialist - Lotus Cars, Norfolk.	Sep-00	Participant in Essential Customer intimacy
Des-eci-6	Design Council UK.	Sep-00	Participant in Essential Customer intimacy
Ids-inh-1	Industrial Design Manager - Electrolux, Spennymoor, UK	Sept 1999 Feb 2000	- Semi-structured and unstructured interviews over period of time. Participant in cocreation workshop
Ids-inh-2	Senior Industrial Designer - Electrolux, Spennymoor, UK	Sept 1999 Feb 2000	- Semi-structured and unstructured interviews over period of time. Participant in cocreation workshop

Table A-3 Coding and description for the individual participants involved in the exploratory pilot study



Main Study

The following tables provide more detailed information on the participants specifically involved in the testing and observation phases of the Main Study. As with the Exploratory Pilot Study, each participant has been attributed a code that represents their discipline (industrial Designer, ideation specialist) and the sector in which they reside (design consultancy, company, student). These codes have been used within the main body of the thesis to allow for cross-referencing.

Industrial Designer	Ids
Ideation specialist	Iss
Design Engineer	Den

Table A-4 Coding for Main Study participants

Company	Com
Consultancy	Con
Student	Stu

Table A-5 Coding for Main Study participants

Code	Description	Date	Interview Type
Ids-stu-1	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief, written to reappraise the design of a specific product. (See Appndix C)	Nov 2001 - Feb 2002	10 week Guided Project. A number of Semi-Structured Interviews and observations. Reflective Session.
Ids-stu-2	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief, written to reappraise the design of a specific product. (See Appndix C)	Nov 2001 - Feb 2002	10 week Guided Project. A number of Semi-Structured Interviews and observations. Reflective Session.
Ids-stu-3	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief, written to reappraise the design of a specific product. (See Appndix C)	Nov 2001 - Feb 2002	10 week Guided Project. A number of Semi-Structured Interviews and observations. Reflective Session.
Ids-stu-4	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief, written to reappraise the design of a specific product. (See Appndix C)	Nov 2001 - Feb 2002	10 week Guided Project. A number of Semi-Structured Interviews and observations. Reflective Session.
Ids-stu-5	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief, written to reappraise the design of a specific product. (See Appndix C)	Nov 2001 - Feb 2002	10 week Guided Project. A number of Semi-Structured Interviews and observations. Reflective Session.

Appendix A: **Data sources for the Exploratory Study and Main Study**

lds-stu-6	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief, written to reappraise the design of a specific product. (See Appndix C)	Nov 2001 Feb 2002	- 10 week Guided Project. A number of Semi-Structured Interviews and observations. Reflective Session
lds-stu-7	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief, written to reappraise the design of a specific product. (See Appndix C)	Nov 2001 Feb 2002	- 10 week Guided Project. A number of Semi-Structured Interviews and observations. Reflective Session.
lds-stu-8	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief, written to reappraise the design of a specific product. (See Appndix C)	Nov 2001 Feb 2002	- 10 week Guided Project. A number of Semi-Structured Interviews and observations. Reflective Session.
lds-stu-9	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief, written to reappraise the design of a specific product. (See Appndix C)	Nov 2001 Feb 2002	- 10 week Guided Project. A number of Semi-Structured Interviews and observations. Reflective Session.
lds-stu-10	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief, written to reappraise the design of a specific product. (See Appndix C)	Nov 2001 Feb 2002	- 10 week Guided Project. A number of Semi-Structured Interviews and observations. Reflective Session.
lds-stu-11	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief, written to reappraise the design of a specific product. (See Appndix C)	Nov 2001 Feb 2002	- 10 week Guided Project. A number of Semi-Structured Interviews and observations. Reflective Session.
lds-stu-12	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief, written to reappraise the design of a specific product. (See Appndix C)	Nov 2001 Feb 2002	- 10 week Guided Project. A number of Semi-Structured Interviews and observations. Reflective Session.
lds-stu-13	Level 2 BA Product Design Student at University of Hertfordshire working on a 'Product Configuration' brief, written to reappraise the design of a specific product. (See Appndix C)	Nov 2001 Feb 2002	- 10 week Guided Project. A number of Semi-Structured Interviews and observations. Reflective Session.
lds-stu-14	Level 3 Product Design Student at University of Hertfordshire working on a brief set by the RSA to reappraise transportation across london (For London Taxi).	Oct 2001 Mar 2002	- A number of semi-structured and unstructured interviews. Structured interview. Reflective Session.
lds-stu-15	Level 3 Product Design Student at University of Hertfordshire working on a brief set by the RSA to reappraise transportation across london (For London Taxi).	Oct 2001 Mar 2002	- A number of semi-structured and unstructured interviews. Structured interview. Reflective Session
lds-con-1	Industrial Designer working for a consultancy developing inclusive expedition equipment	Mar 2002 Sept 2002	- A number of semi-structured and unstructured interviews.
lds-con-2	Industrial Designer working for a consultancy developing inclusive expedition equipment	Mar 2002 Sept 2002	- A number of semi-structured and unstructured interviews.

Appendix A: **Data sources for the Exploratory Study and Main Study**

Iss-com-1	Ideation Specialist Working for the Advanced product Group, European Vehicle Manufacturer	Dec 2001 Dec 2002	- Guided Innovation Project. A number of structured, semi-structured and unstructured interviews. Observation.
Iss-com-2	Ideation Specialist Working for the Advanced product Group, European Vehicle Manufacturer	Dec 2001 Dec 2002	- Guided Innovation Project. A number of structured, semi-structured and unstructured interviews. Observation.
Iss-com-3	Ideation Specialist Working for the Advanced product Group, European Vehicle Manufacturer	Dec 2001 Dec 2002	- Guided Innovation Project. A number of structured, semi-structured and unstructured interviews. Observation.
Den-com-1	Design Engineer Working for the Advanced product Group, European Vehicle Manufacturer	Dec 2001 Dec 2002	- Guided Innovation Project. A number of structured, semi-structured and unstructured interviews. Observation.
Ids-com-4	Industrial Design Director within a large company designing office furniture and environments	Mar 2003 May 2003	- Semi-structured and unstructured interviews.
Ids-stu-16	Level 3 Product Design Student at University of Hertfordshire working on a brief set by Herman Miller to investigate office environments for future innovation	Mar 2003 May 2003	- Semi-structured and unstructured interviews.
Ids-stu-17	Level 2 Product Design Student at University of Hertfordshire working on a brief set by Herman Miller to investigate office environments for future innovation	Mar 2003 May 2003	- Semi-structured and unstructured interviews.
Ids-stu-18	Level 2 Product Design Student at University of Hertfordshire working on a brief set by Herman Miller to investigate office environments for future innovation	Mar 2003 May 2003	- Semi-structured and unstructured interviews.
Ids-stu-19	Level 3 Product Design Student at University of Hertfordshire working on a brief set by D & AD and Nesta. Project investigates 'baby food'	Oct 2002 Dec 2002	- Semi-structured and unstructured interviews.

Table A-6 Coding and description of participants involved in the Main Study

## **Interview Process: Sample**

This appendix provides greater detail with specific regard to the conduct of the interview and observed practise that took place during this research project. This appendix contains:

- Interview Map: Highlights themes for open ended interviews
- Interview Structure: highlights format for semi-structured interview
- Interview Presentation: Guide to presented information during structured interview
- Interview Questions: Sample questions for focused interview.

### **1.0 Interview map**

#### **Frame 1. – Specific Design Process Background**

What and how design briefs are delivered to designers: Format, communication constraints.

#### **Frame 2. – Post design brief practices**

Designers' interpretation of design brief:

- What information does the designer use to define the problem/design/solution space?
- HYP: Most designers try to generate as much freedom for themselves as they can at this stage
- HYP: Designers have little or no influence on the original formulation of their design brief

How are constraints and design parameters interpreted?

Drivers of the design space:

- HYP: The designer drives this space from within
- HYP: Client / decision maker drives the design space externally

#### **Frame 3 – Conception to Delivery**

Ask designers to map their own design process. As it is and how it could be ideally/

- What are the inhibitors that constrain the 'ideal'?
- What (information) is used to 'inspire' the designer between brief and design delivery.
- How is the design space constructed?
- HYP: the designer has no mechanism to allow the design space to grow
- HYP: the designer has no means of supporting the intellectual value of inspiration
- HYP: the designer has no mechanism by which a move beyond an artefact brief or design space can be supported

#### **Frame 4 – Inspiration**

How does the designer decide which inspirational material to exploit and which to disregard?

Where do people feature within inspirational design material?

- HYP: People will NOT feature in product delivery oriented inspirational material
- HYP: People as drivers cease to exist after product brief interpretation

### **Frame 5 – New possibilities; A new Approach?**

Present ED+ as a pathway to the growth of design space and as a mechanism for supporting intellectual value derived from inspiration or vice versa.

### **2.0 Interview Structure**

Points that this series of interviews need to validate or substantiate:

- **Designers use information in the service of ideas:** Observation to inspiration to ideas.
- **Presentation of written media isn't necessarily (appropriate?) for use by designers:** Designers don't read reports. Do they read at all? (observe input preferences)

#### Sub points from which understanding is necessary

1. Information passed to or acquired by designers including their own experience is used primarily in the service of ideas. More specifically, inspiration to artefact. Need and solution should fall in between. If not, are there artefacts in other contexts that may provide alternative sources of observation. (Alternative activity sets). – Perhaps Peerage Congregation
2. Direct observation by designers is effective because it provides a direct link between the user and the inspiration from which 'the idea' is derived.
3. Understanding what designers regard as inspiration, allowing them to present sources of personal inspiration prior to interview may provide some insight into WHAT designers regard as inspiration. Here I suspect that tangible artefacts, and sensory material will be prevalent. It should be patently obvious that designers, when considering solution delivery rely on sensory stimulus for inspiration. Moreover, many will rely on artefacts or artefact abstractions for their inspiration when considering product delivery.

Note: I am suggesting that observation may not simply contribute to increased customer understanding, but using appropriate techniques, may form sensory material (inspiration):

- What does inspiration mean to a designer as an individual?
4. With this in mind 'inspiration' information is used in the service of solution ideas. How can inspiration better serve user-centred needs?
  5. What format of information is regarded as inspiration, and exploited during the concept design process?
  6. Though techniques are available to allow designers to increase their understanding of customers and their experiences – even in true context. There is still a reliance upon artefact oriented sensory inspiration from a product specific field to inform the delivery of products.

#### End of interview

Whilst designers may have a level of customer understanding either directly or 'passed' to them, it remains detached from the product conceptualisation process. There is an inspirational gap to bridge between the customer and the product delivery. Whether the customer is in the designers' mind and whether they form part of the product inspiration is little understood.

### **3.0 Interview Presentation**

Re-framing a design brief: Demonstrate a shift from product specific to experience related. Emphasise the 'real-life' impact of this shift.

Note how observation can support and initiate inspiration that goes beyond mere product improvement – designing products, services and solutions that are better than the ones before because problems with product interaction have been observed isn't good enough. What are the wider implications of such designs – are they not insular by their very conception. All too often designers work and use their own experiences to conceptualise solutions. Is there's the only view, or indeed the only informed view? I think not! What we can say is that their mechanism for introducing a multi-perspective view, or recognising that their understanding of their customers' lives is inadequate is only the first step on a pathway that can lead them closer to 'essential customer intimacy'.

It is becomingly increasingly important that, as designers we are able to recognise that our products, services and solutions, to what we perceive to be problems may not necessarily accurately reflect the real problems in hand, nor might they be providing the most appropriate support for lifestyle or lifestyle change. We as designers are in a unique position. We can direct and affect the way people live their lives through the artefacts and experiences we are able to create. This power should be used with the appropriate responsibility. This is not a sermon towards the sustainability of design more a warning to those who possess the necessary arrogance to ignore the real lives of the people around us.

The frustration caused by a designers inability to communicate the intellectual value of his own work beyond the artefact he produces stems partly from the designer assigns to himself and to the roles others assign to the designer. The perception of the designer is not necessarily of his own doing, and its origin in this case is somewhat incidental. The issue in hand though, remains. That is, the designer is unable to communicate his worth beyond the artefact he produces. All this is about to change - and for the better!

Why does the designer insist on relying so heavily on the tangible outputs of design? Particularly when we consider the valuable insights, observations and genuine moments of clarity that have sparked the innovation that has manifested itself in this one concept that his audience may not even understand. Why then must a designer realise that these insights, nuances of understanding may not be at all obvious to his audience? Because he takes great risk in assuming that all his value is visible in his sole artefact.

The designers own construction of their own design space may suggest a supporting framework that can provide additional perspectives when the communication of design conceptualisations arises. First however, the designer needs to make a critical shift in emphasis of his work. That is, the designer must now make a shift away from an output driven communication to a concept and value led audience. Recognising that he is likely to be unique in understanding the potential value of his design output is key to providing a more holistic view of the potential wider effect of any given design led solution?

With this in mind, a shift in the design pathway can be communicated graphically to demonstrate one possible way in which a change in design approach can yield not only an expansion of the design space, but sustained support for more radical design visions. This same interface can allow the designer to communicate specifically where emphasis has been placed and could have been placed throughout a design process.

The effects of an empathic design pathway are at least 3 fold. The first of which, concentrates on stimulating the designer in a way that has not been achieved through traditional market research. Apportioning blame for this situation is unimportant, though one cause of a designers inadequate understanding of the people for whom he designs does stem from a designers regard for inspiration, and that design inspiration is often driven by artefact and not people, or to be more specific, potential customers.

The second looks at expanding the designers' problem and solution spaces (inherently his design space) through a series of guidance oriented methods. It's important to recognise that the placement of and Empathic Design framework is not intended to prescribe methods, tools techniques - and certainly not to anticipate outcomes. It is designed to steer a designer's pathway away from the specific product delivery and interaction attributes until an understanding of experience, scenario and activity is developed. The designers' ability to function without the initial visualisation of solution ideas is critical in an approach to understanding the experience of customers. Why? One can certainly argue that the ability of a designer to generate an appropriate solution is compromised when the designers understanding - neigh empathy for the problem is not maximised.

### **4.0 Interview Questions**

#### **Prior to Interview:**

1. Ask interviewees to bring 'inspiration' with them.
2. Ask interviewees to bring 'inspiration' they would use during design activity.
3. Ask interviewees to bring with them examples of 'inspiration' they would use specifically in the generation of ideas.
4. Consider example projects that they wouldn't mind discussing - example material would be beneficial.

First Question in each frame to be given in advance of the interview

#### **Frame 1:** Specific Design Process Background

1. Can you give a brief description of you current design process?
  - 1.1 How are design briefs delivered and communicated to you?
  - 1.2 In what format are design briefs delivered?
  - 1.3 Do you have an influence over the parameters that are defined within the design brief?
  - 1.4 Does a negotiation process occur during design brief delivery?
  - 1.5 How much consideration is paid to the designers' input at this stage?
  - 1.6 How are you affected by the role a designer plays the the design briefing process?
  - 1.7 How might this process impact upon the subsequent processes within design?
  - 1.8 What changes to current design briefing processes would you like to see implemented?

#### **Frame 2:** What happens next

2. Can you describe the process you go through as you interpret a design brief?
  - 2.1 Can you highlight your own priorities when considering the interpretation of a design brief? (Examples would be useful)

- 2.2 How do you go about exploiting the often limited freedom available to designers in a design brief?
- 2.3 Do you find the levels of freedom granted by design briefs restrictive or frustrating?
- 2.4 How do you find excitement in any design brief?
- 2.5 How do you capture the 'essence or 'spirit' of the design brief?
- 2.6 How do you influence your own design space?
- 2.7 What methods do you have that allow you to maximise your role when the design space is being formed?
- 2.8 Do you find that by the time you reach the design studio, the definition of the design space has already been decided?
- 2.9 Are you able to drive design space definition?
- 2.10 Can you describe your relationship with decision-makers during this process?
- 2.11 How does your role in defining your design space differ from that of a given decision-maker?
- 2.12 How is your design space finally constructed?
- 2.13 How would you define the boundaries of a given design space?

### **Frame 3:** Conception to Delivery

3. Are you able to map your personal design process both in ideal situations and how it adapts to everyday design activity?
  - 3.1 How do factors within everyday design activity affect your 'ideal' design process?
  - 3.2 What do you bring from the design brief to 'inspire' design activity?
  - 3.3 During design activity, are you able to redefine your design space, and redefine the parameters that constrain it?
  - 3.4 What might you regard as inspiration when considering design activity?
  - 3.5 In which areas of your design process might you consider inspiration most critical?
  - 3.6 What impact does inspirational material have on idea generation?
  - 3.7 How might you include 'inspirational material' in your communication of ideas?
  - 3.8 How do you communicate ideas and concepts to decision-makers?
  - 3.9 What material is used to support these ideas and concepts?
  - 3.10 How might you communicate further intellectual 'value' (beyond output)?
  - 3.11 What are common factors when considering the communication of ideas and concepts – in terms of format and content?
  - 3.12 How do you the spirit of the design brief to the spirit of the idea or concept?

### **Frame 4:** Inspiration

4. Can you describe and provide examples of stimulus material used during design activity?
  - 4.1 Would you regard elements of this stimulus material as inspirational?
  - 4.2 How does stimulus material differ between different stages of design activity?
  - 4.3 Can you provide examples of critical material used during different stages of your design process?
  - 4.4 Does 'background' inspiration feature in your design process in that it is regarded during much design activity across projects?
  - 4.5 In what format does this inspiration occur?
  - 4.6 Can you provide examples?



## Appendix B: *Interview Practise*

- 4.7 Can you describe the decisions that take place in order to differentiate between that material that is exploited and rejected in the pursuit of ideas?
- 4.8 How do you communicate your inspiration to others?
- 4.9 Is there a prescribed communication format?
- 4.10 Is there provision for communication beyond output?

### **Frame 5:** A new Way

- 5. Do you feel that there is room for the expansion of the designers role in terms of influence and communication?
- 5.1 Present ED+ as one possible pathway to the growth of the design space and as a mechanism for supporting the intellectual value derived from inspiration
- 5.2 Do NOT present benefits or trends observed.
- 5.3 Ask opinions - i.e. how it relates to individual design processes?

This appendix provides greater detail with specific regard to the individual project briefs that were set and observed during this research project. These briefs have been devised in collaboration with the University of Hertfordshire Product Design team in order to adhere to the required learning outcomes.

### **Brief 1: Product Configuration**

#### **UNIVERSITY OF HERTFORDSHIRE**

FACULTY OF ART AND DESIGN

#### **PRODUCT DESIGN SCHEME**

#### **Course: Product Configuration 2 (2DES0005)**

It is essential as a designer of objects not to accept the norms as assumed. If we were to do that, we would not only fail to put ourselves one step ahead of the consumer but also ensure that our product development will stand still, which is exactly the opposite of what our clients require of us. Having said that, formats may be stipulated in a brief, or the sensible solution may be the existing one. That does not stop us reconsidering it! Very often a Product Designer's main contribution comes from questioning existing solutions, proposing different approaches which better address the needs of today. Two simple approaches are to observe the real needs of people and to reappraise the technology used. The main focus of this module deals with the way in which designers understand technology and production and utilise this knowledge when developing designs.

For convenience this project is broken down into sections which all relate to the development of a product. Firstly you must select a product to reconsider. Select one from the list below:

- Hair Dryer
- Torch
- Coffee maker
- Electric Toothbrush
- Electric Shaver (male or female)
- Car vacuum cleaner

Other products can be considered but only with the consent of the staff.

To generate ideas that meet the requirements for your product you must first build up knowledge of what exactly you are trying to design and who for. That is by observing the need and investigating potential technology you will be able to write your own brief. It is important to realise that you are designing from scratch, assuming that none of the products necessarily meet the aspirations that you define. This is design from first principles.

#### **Part 1: Product Analysis**

Get the product you intend to redesign. Take it to pieces and record visually, either by drawing or with photographs how it is constructed, and what components are used. As

part of this research you should analyse how the components are constructed and what material they are made from. That is if it is a plastic component has it been vacuum formed or injection moulded? or by another process. If you are unsure of the material then initially record what you perceive as key characteristic, flexibility, colour, heat resistance etc. During this investigation you should also discover how the product achieves the function for which is intended.

The exercise may be carried out as a team project.

It is essential that you understand what the function of a product is and how this is achieved if your design is going to be successful. Also many product improvements are gained by re-assessing how components relate to each other and the implications this has on the external attributes of the product and the way we expect the user to control and operate it.

### **Requirements**

- A2 drawings detailing the following information:
  - Construction
  - Components
  - Parts list and materials
- A2 diagram illustrating how the product fulfills its intended function.

Remember that as a designer you should always present information in a visually pleasing way.

### **Part 2: Alternative systems**

From the above analysis you will understand an existing product. You should have enough information to start reconstructing it as a new improved design. However before you do this you should ask yourself the following questions:

Is there a better way of achieving the function?

Can different materials be used?

Can we get more performance from the product (can it do a variety of associated functions)

Within this questioning, look at other products both within the product area and in differing sectors. Look historically as well as to the future. Visit museums and read technical magazines. Have an open mind to possibilities and make links between a diverse range of products and your immediate need.

### **Requirements**

- A4 justification of the technology proposed for your new product, including a rationale of alternative methods.

- Dimensioned drawing of the major components of your intended system (you will need this as a starting point for a new design)

### **Part 3: User Scenario**

Produce a storyboard of the product in use. This will include time when the product is not being used and also when it is misused. You are building up a picture of how, when, where the product is used and understanding how it is controlled, that is the hard and soft interfaces. Within this consider the following questions for which you are seeking an answer:

1. What it is used for
2. Where it is used
3. Who uses it and why
4. Are there any concurrent activities

The purpose of this is to understand the product from the user's perspective. You will gain knowledge of a products good points as well as areas where improvements can be made. This knowledge is crucial if you are going to make advances in the design of the product and not just produce a restyled product.

### **Requirements**

- Storyboard s(A2)

Activities 1, 2 & 3 should happen concurrently.

This is a holistic approach in that you are considering your proposal from all angles. You will be surprised how refreshing this is in that it will not only challenge pre-conceived ideas, but also give pointers on how to develop new solutions. These may well be a radical new way of doing something or just a more rational approach. Both should be considered. The important thing to remember is that without thinking about people and tasks in this way products will cease to develop and in time seem as antiquated as a dinosaur.

Once these investigations have been completed you should be able to tell us what you want to design. That is the DESIGN AMBITION for your development process.

### **Deadline: Parts 1, 2 & 3**

Work from Parts 1, 2 & 3 should be completed by Friday 6<sup>th</sup> December. A seminar discussion will then be held.

**PART 4: Development**

You should, from Parts 1, 2 & 3 understand why there is a need for design and have enough information to start developing new solutions. This is a clean sheet of paper approach allowing you to challenge all existing notions of the product. The criteria by which you select ideas are the research undertaken. That is you justify the design by either an improved functionality or a product, which is more applicable to the situation of use.

Consider your design from the following criteria:

- The users standpoint
- On a functional level
- Production and materials

Development is a concurrent activity running alongside the scenario investigations and research. It will be an empirical process starting from first principles. That is one of experimentation, testing/evaluation, re-appraising, modification, appraising, refinement until you are satisfied that the design is complete enough to be called a design proposal. Remember that you are designing into the experience and not just another device or machine.

To do this you will take your conclusions from the initial investigations and develop most likely answer in the form of full size layout drawings and full size test rigs. These can then be tested against the criteria, which you set for the product; these again will be ascertained from the initial research. You will discover that your proposal has both good and bad points. Development is all about emphasising the good points and eliminating the bad ones. This is a process of development where you will be perpetually refining your test rigs and re-appraising them until you are satisfied that it meets with all your criteria and you can call your idea a design proposal. It should be developed to a point where it can be realistically translated into a manufacturable product.

**Requirements**

- Evidence of research
- A one page document (A4) which outlines what and why you are designing
- 2D layouts
- 3D rigs

**Part 4 Deadline**

All of the above should be finished for the interim crit on Friday 10<sup>th</sup> January

At this interim crit the full requirements will be handed out.

**Brief 2:** *Empathic Design: Emotional Connections*

University of Hertfordshire

Faculty of Art and Design

Product Design Studies 2A: Course 2A 1DES0048

Tutor: Richard Barrett

## Ford: Empathic Design and Emotional Connections

### Introduction

The Ford Motor Company are the foremost producers of cars in the world. They are firmly established as leaders in automotive design and production. Ford are renowned for their interest and success across market sectors.

This pilot project will be in collaboration with the Advanced Product Group at Fords Technical Centre in Dunton. You will be informing design processes at the very earliest stages of new product development and across vehicle programmes.

Students have the 'advantage' of fewer pre-conceptions, and by taking a step back from automotive design and the delivery of product features you have a project that can uncover significant opportunities for innovation.

Two strands you will be exploring during this module are:

**Emotional connections through product identity**  
**Connections to activities: both actual and aspirational**

You will be divided into project teams: As Imagination Project Teams in order to conduct your research

Teams will each be awarded one of the following target audiences, each with significant social and attitudinal differences:

Couple expecting child  
Outward bound Couple with young child/children (pre-school)  
Family with older children  
Active Grandparents  
Young couple - no children  
Couple with elderly family

Consider the products that impact upon the activities that are central to the relationships between the people involved in sharing that experience.

**Create a visual map, which can be populated with activities and key observations throughout your research process.**

Based on your Target Audience; identify emotions that are associated with specific activities and the relationship between a new parent, or a parent of a young child or a grandparent.

Following the identification of these emotional drivers: observe activities that new parents or parents to be take part in: look at products they interact with, people they meet, things they do, frustrations they show.....

Observe how these customers actually participate in these activities and how this may differ what they might really want to. Focus on:

Where do they go?

What do they do?

What are they trying to achieve?

What are their overriding emotions?

**Remember you're not designing vehicles: you're defining vehicle directions! And you're not designing anything yet!!!**

**You'll be given key words and areas of product focus after your research investigation.**

Your Scenario map should contain a minimum of one activity each for further investigation and idea development.

As individuals: you may continue group research, but you must each develop and present a design innovation to meet the needs of you customers.

### **Assessment requirements:**

**Director Show (Product Design Skills 2A):** Communicate customer understanding and key insights that have given rise to your design solution and informed your design decisions:

**Note: Design solutions must be supported with communicable observations.**

**Presentation of Innovations:** 4 A3 boards presenting your innovation and the story behind it. This is likely to include visual representations of your idea; supported by a scenario of use and environmental & social contexts.

**Group Scenario Maps:** Retain and present all visual maps.

**Individual Activity Maps:** You may choose to present this electronically or on an A2 Board supported with multimedia recordings of your observations.

**Presentation Note:** Remember that you will be given the chance to present your work, but your insights, design decisions, and innovations will also have to 'stand alone'. So your multimedia presentations are critical when communicating to an audience that doesn't understand your work.

### **What's next.....**

Introduction to Empathic Design tools: workshop next week!!

## **Observation versus Inquiry**

This appendix provides an excerpt from the original publication 'Spark Innovation through Empathic Design' (Leonard & Rayport, 1997, Harvard Business Review). It illustrates the clear differences stated by Leonard and Rayport between enquiry attributed to a traditional market research paradigm, and observation set as a fundamental principle of this original proposal for an Empathic Design approach to uncovering latent and tacit needs of customers.

### Inquiry Versus Observation: What's Different?

#### Inquiry

People can't ask for what they don't know is technically possible.  
People are generally highly unreliable reporters of their own behaviour.  
People tend to give answers they think are expected or desired.  
People are less likely to recall their feelings about intangible characteristics of products and services when they aren't in the process of using them.  
People's imaginations - and hence their desires - are bound by their experience; they accept inadequacies and deficiencies in their environment as normal.  
Questions are often biased and reflect inquirers' unrecognised assumptions.  
Questioning interrupts the usual flow of peoples' natural activity.  
Questioning stifles opportunities for users to suggest innovations.

#### Observation

Well-chosen observers have deep knowledge corporate capabilities, including the extent of the company's technical expertise.  
Observers rely on real actions rather than reported behaviour.  
People are not asked to respond to verbal stimuli; they give non-verbal cues of their feelings and responses through body language, in addition to spontaneous, unsolicited comments.  
Using the actual product or a prototype, or engaging in the actual activity for which an innovation is being designed, stimulates comments about such intangibles as smells or emotions associated with the product's use.  
Trained, technically sophisticated observers can see solutions to unarticulated needs  
Observation is open-ended and varied; trained observers tend to cancel out one another's observational biases.  
Observation, while almost never totally unobtrusive, interrupts normal activities less than questioning does.  
Observers in the field often identify user innovations that can be duplicated and improved for the rest of the market.



### **Co-Creation Workshop Summary**

This appendix provides greater detail with specific regard to the individual actions that were observed during this research project. It contains both a sample letter of intent to collaborating companies and a transcript (not coded) of a co-creation workshop. It is important to note that the quotes used within the main body of the thesis are intended to be illustrative and as such are representative of the comments made by a number of participants. There are instances where one participant is cited more frequently. This recognises that some participants are more articulate, and comments are likely to be representative of a number of participants. It is likely that one participant has articulated or translated a common point more succinctly or precisely.

#### Design Task 1 – Team 1

Comments were made that the time allocated for the task was too short. It is true to say that more depth could and would have been achieved if fewer objectives were proposed with greater amount of time. Perhaps concentrate on identifying needs in morning session and as solutions appear merely communicate those as easily as possible be it graphically or in written form.

“What do the users want out of it?”

Must cater for a number of people as well as one person

Don't want to spend time bending down

Difficulty calculating size of objects

Confined space

Flexibility / modularity could be a solution

At this point, designers have already begun to refer on their own experiences as users rather than the user oriented information provided.

“Remember we're not designing for Electrolux, we're going beyond that”.

Dishwashing is part of cooking – consider the whole solution

“Check the dishes in”

“Careless routine”

“Throw them away”

This task has quickly developed into a discussion. The discussion appears not to be well directed. May require more direct facilitation.

Video Cameras are too far away – picture quality is poor and sound quality is worse. Could be improved if people talked in turn and microphone was closer.

Discussion depends considerably on the type of people

## Appendix E: **Co-creation Workshop Transcript**

"We need to remove technology from our discussion and concentrate on user issues – they may not want a dishwasher but clean dishes".

They're relying on their own knowledge rather than information. - There is a need for more information.

There is also a tendency for these designers to rely on their own experiences as users. Basically they're designing for themselves.

"We also have to consider the level of involvement of the user"

Loading a dishwasher has too many bits and pieces – there are too many tasks.

Later on – designers are now totally relying on their own knowledge and experience

"Sharp knives are a problem – for people and dishwasher"

What about excitement?

Perhaps we should consider what people do with dishes and utensils and cater for that.

Look – the wheel chair person had problems with the traditional and table top dishwashers.

Designers are referring to the still images, though we need to encourage designers to take on board and understand the stimulus material.

We need to use minimum energy – recycle water.

"How can we affect consumption through interface?"

How do we look at interface?

Should it be easy to understand?

What about mental effort?

Status?

Do people need or want these gizmos?

Does basic communicate efficiency?

Now designers are relying on others knowledge as users and designers?

Should we treat dishwashers as washing machines?

We should consider longevity or at least the perception of longevity.

We need to look at: Look, Quality, Sensory appeal.

Designers now appear to be referring to the still images more and more.

## Appendix E: *Co-creation Workshop Transcript*

"What the user wants must be blindingly obvious"

"We must think in terms of what people want to do?"

"We need to consider peripheral information – designers can't/won't or do not think of needs and tasks in isolation – they need to be contextualised".

Computer/child interface – entertainment/fun

"Let's not think of a dishwasher in terms of a metal box with a wire frame inside"

"Let's try to make it a soft sensuous thing so that people want to interact with it".

"People buy things because they want to be involved in the experience – they want to do all this work. Driving for example".

"Skill + Involvement (using a products full capability) = Enjoyment".

- Fun through process
- Use material quality
- Dishwashing is a chore
- It should be as easy as child's play
- Do we involve children as we would with manual dishwashing?

"What about a load efficiency indicator? – How efficient can you make your dishwasher?"

Make it more interesting and not repetitive – variable

"The users needs are.....?"

We are constantly making visual calculations regarding loading. What a solution could do is assist that visual calculation – Square peg in a round hole.

- Children should understand
- Loading should be intuitive
- How do we stop overloading?

Feedback from the 'dishwasher' interface – sexy voice? .

"We need to get to basic requirements"

Note: Designers are beginning to consider solutions rather than consider needs.

- Do they need more time to consider needs based on stimulation?
- Should they be considering needs of users without the possibility of generating solutions?
- Is the process of observing needs and generating solutions non-linear?
- Should these two processes be concurrent or chronological?

"We need to think about the whole interaction"

Note: I need to clarify presentation requirements – perhaps even restrict them further.

"Versatile and flexible size and shape"

## Appendix E: ***Co-creation Workshop Transcript***

Space involves an interface for children – they can see clean dishes

Holographic image to instruct loading or provide load corrections – intelligent system.

Note: All designers want their own ideas to go forward.

- Digital loading
- 3D scanning
- Hands free breast measurement – scan body size

Note: we need an objective focusing of ideas – not filtering!

Note: what is the influence of the pessimist in the group? How do we overcome their influence? Could we use them as a silent observer?  
Should assign spokesperson at the beginning of the exercise

### Presentation – Task 1 – Team 1

Forget about; Solutions, technology, what's around.

Concentrated on what needs are.

Primary needs

- The need to clean dishes is a basic need.
- Needs to be done using minimum effort, both physical and mental.

We've not found it easy to clarify needs:

- We're protecting and maintaining objects with which we have emotional attachments.

We're not finding it easy to rate their importance either.

- Cost
- Robustness
- Social enjoyment
- Social event
- Involve children

Defining Solutions

Key points:

- Child's play – simplicity
- Entertainment – not sterile
- Feedback
- Modularity
- Ergonomic considerations
- Efficiency

We then considered the wacky:

- Interactive interface
- Holographic loading

## Appendix E: *Co-creation Workshop Transcript*

### Presentation – Task 1 – Team 2

#### User Requirements:

- Based on Video information and our own experiences
- Admit that we tended to fall mainly on our own experiences
- Looked at how we worked together

We tended to steer away from 'dishwasher' as a concept.

Again we tended to lean towards generating solutions rather than identifying needs.

We looked at need and solution dimensions. There were 2 key things:

- Hassle free – vivid mental picture of zero hassle, but what does that mean?
- Product design should fit the person – 'good design' and 'human factors'
- Solution should work well – performing the tasks that are required – need reassurance.
- Should fit environment. We took the experience and asked how it relates to lifestyle and environment.
- 'Looks good' includes a range of factors that contribute to the user experience.
- Low cost – including maintenance. How do you know that it's cheap to run throughout its lifecycle?

#### Product Visions

- How do you translate this information into visual manifestations?
- How do you balance convergent and divergent thinking?
- How does the designer move between needs and solutions?

#### Solutions

- Production line that cleans and stacks
- Address the need for zero hassle
- Do we need mechanical solutions?

Let customers design their own house wares - electronic interface with design knowledge dispensed to customers. Re-design and re-use rather than clean plates. "Eat the plates".

Final concepts – more focused towards the world of Electrolux

- Need for housework not to be a chore
- It's horrible work
- Address low cost
- Amount of dishes when we want – not a fixed volume box.
- Address durability
- Juke box idea – slot in dirty things

Our solutions have been based on a convergent process whereas the exercise was supposed to be divergent.

Note: More time and greater facilitation are required to ensure ED is actually given conditions in which it can work. What are the conditions necessary to facilitate ED?

## Appendix E: *Co-creation Workshop Transcript*

### Discussion – Task 1

Could have had more basic video footage: How other cultures deal with the same issues.

Need to find ways of focusing ideas.

“Do external perspectives become implicated with internal convergence and therefore less empathic as they become involved in the team”.

“There’s an implicit thing about people – a huge tendency to assume”.

“Can we discuss people and what they are like earlier in the design process. We talked about mental needs as well as physical needs. We could have had sound with the video”.

“Think about the activities that have nothing to do with the product. Designers need to think about people. They get pre-occupied with features and how they can solve presumed problems rather than looking at people and lifestyle and designing for those needs. How does a product affect lifestyle?”

How do you explain to people without showing them designs?

### Discussion – Session 2 – Team 1

Question: What is Empathic Design? What is Empathic Design not?

- Understanding the user – Real users.
- It’s more than understanding it’s being in touch with them.
- Identifying real needs.
- Go out and understand the customer
- Designers do their own research WITH market researchers and understand what market researchers know.
- Are our needs product or social/lifestyle based?
- Distinguish between REAL needs and PERCEIVED needs and customer reaction. I ‘need’ this.
- How do we get too real needs?
- Real needs are always graphical.
- This needs to balance the design process – does it help designers to focus and look beyond manufacturing and industrial objectives?
- “It’s designing what’s appropriate”
- Why are we focusing on looking at products?
- ED is a tool that can balance the design process – elevating needs within the design process.

Customers are not proactive – generating needs that don’t exist, creating new needs. I.e. Sony Walkman.

How do we differentiate between real needs and perceived needs?

Make the solution to a real or perceived need work for people.  
Customers only react to what they’ve had.

“Are you looking at what they feel they need based on use and where they stand – or a bigger need which they are going to be a part of? Like using less energy.”

## Appendix E: *Co-creation Workshop Transcript*

"When water first came out of taps, people were surprised"

We are looking at needs – and we are projecting what a need can be and can mean in certain scenarios.

'Designers care' – they are fascinated but please themselves. They care – but more about products than people.

Marketing and designers should be learning ED and communicating with each other.

There is an issue of communicating and language and justification

Got to relate to commercial outcome.

"Is design strategic or are we saying that we are designing for peoples needs?"

Senses and sensory perception are extremely important.

Could we call it a spectrum of needs? – 'Feel' and 'emotion'

Design should support the customer's view of the world – their perceived need. Or change the customer's view of the world.

Create an Analogy of Empathic Design – Team 1

Is the user the centre? Should the user be the centre of Empathic Design?

Communicating to the user that their perceived need is not an actual need.

If we design a solution – how do we communicate it?

No one has ever deviated from a technological path – people know what they want to produce.

People (designers) need a constant stream of information.

"If it doesn't function or the user can't use it then the design has failed on a basic level."

You have to look at every aspect of the product

Projection of needs rather than evolution-based designs.

How does this relate to universal design?

Holistic design – Solving basic human needs through design – this is not necessarily what people buy.

As a designer you have to balance both. You cannot solve problems if users don't buy your product.

Public transport – Time tabling your travel. Relying on something that is perceptually beyond your control.

## Appendix E: *Co-creation Workshop Transcript*

Note: Teams didn't keep to the task of producing 5 statements  
Outcomes - team 1

1. Understanding the real user – lots of variations
2. What is the real need?
3. Using all of the senses
4. More observing and listening rather than talking and doing
5. Discovering the unexpected – where are they? Where do they come from?
6. Fundamental Vs perceived need
7. Does a need influence whether a solution works?
8. Are perceived needs more important?
9. Marketing and design integration
10. Integration with users as a process

Cake Shop

Company as a cake shop and all the understanding that goes with that

- Owner designs cakes so that people will buy them
- She knows her customers intimately – She knows her customers Granny and all other friends and relatives
- Lots of people come in for different reasons – to chat, catch up, gossip, try new things etc.
- She knows what they want
- Essential – she has a financial need (we need to be conscious of this)
- Must have the right product
- She designs it in order to be sold
- People process – In a small shop if you're a horrible person your shop will die
- You need a people focus
- Are each of the cakes unique
- People base their purchases on different senses
- Question: Is ED therefore decoration or icing? Or is it more fundamental ingredients?
- Answer: It's a mixture of both, it's atmosphere, experience.
- There are real needs and perceived needs – we can't ignore either.

"If there was no icing – peoples needs wouldn't be met because they wouldn't go."

You decide everything – this allows you to control everything and so can be empathic.

Design Task 2 – Team 1

Consider "trunk as a space"

Basic need for space – appropriate space

Need to have method of transporting? – Infinitely variable, intangible.

Note: After only 5 minutes speculation is based on own knowledge

"Intuitively, the UK doesn't own the level of storage systems as other European countries



## Appendix E: ***Co-creation Workshop Transcript***

Consider the complete packaging of the car

You may only go to Ikea once a year

Users try and solve their own problems – perhaps we should consider frequent but not daily events

Note: designers are discussing REAL needs – but based on their own knowledge and experiences. They are users of cars and not car designers.  
Already categorising types and levels

“Most companies seem to be bad at providing safe rattle-free storage areas.”

Space in spare wheel

Do we want to keep things neat?

Referring to video – Tailgate that is unintrusive

Do you get bad back loading heavy stuff?

Loading platform?

“This is a stressful situation” – look at what we could see in the Tesco’s car park.

People park too close – cars have been bumped by someone else’s trolley.

If you leave the trolley too long, you’re blocking someone else’s as well as your own access.

“Poor design of car parks”

Operation should be hassle free.

“What you’d like is.....” Andy Peckham

Problems with immediate environment need to be considered

Need to maximise loading potential

Mood of users

Security

Shrink wrap cover to keep stuff in place

Retractable sides to loading area – movable walls means versatile space

Ability to lie stuff down with the boot open

Common problem as we can see is stuff sticking out of the back and the car is in no way designed to accommodate them

“Could you still lock down the tailgate and leave stuff sticking out?”

## Appendix E: *Co-creation Workshop Transcript*

Has your car actually taken everything you want?

“It doesn’t what size car you have, you always try and load too much”

Glass folds up and tailgate folds down and you could have bellows to cover the load

“It’s a frequency thing – you only have to do this once or twice, but you couldn’t forgive your car if it couldn’t carry your daily shopping”

You’d love it if your car could take exceptional loads

“We like the amorphous jelly – but I don’t know why”

“Something flat comes down and grips the load”

Note: Steve wandered between groups too much!

Self-Tensioning – variable loads can be kept down

Integrated shopping trolleys – don’t have to use supermarket trolleys – particularly with self scan shopping

Note: they’re drawing on their own and not designing by consensus.

“Vacuum packed shopping”

Variable height of the roof of the car

Drive through shopping – European Standard Docking System

Zap Bar code and stuff is already in the car by the time you pay.

How can we influence the experience of shopping?

Do we want to reduce energy?

Can we make shopping and loading novel and fun?

How can we elevate the customer experience?

Beam up shopping?

“Collaboration in designing areas of vehicles to draw on specific areas of expertise”

An ‘Outdoor’ vehicle

“We’ve missed semantics completely”

## Appendix E: *Co-creation Workshop Transcript*

### Presentation – Team1

Identified 3-4 main needs

1. Transport goods and tackles
2. Ease of loading and unloading
3. Flexibility: a) Common/daily – i.e. children  
b) Work things, small things and pets  
c) Heavy items, infrequent, visit to the tip etc.  
d) Holiday, furniture
4. Lighting

Problems and conditions

1. Weather
2. Shopping trolleys – not user-friendly and not easy to unload
3. Insufficient car park space
4. Multiple distractions as a hassle
5. Security – theft is a big issue
6. Dangerous situation – very exposed
7. Ergonomic issues
8. Dirt issues

Mood

Mood of loading and unloading is stressful and you want to get it over with. Though there is user involvement it is not desirable. Think about what you are doing.

“Necessity and chore.”

### Solutions

1. Lifting heavy loads – difficulty – extendable tail lift.
2. Problems of irregular size and pinning stuff down (Air bag from the roof line - but would need a warning for children and pets)
3. Vacuum pack that sucked to the floor (same warning applies)
4. Lifting things in – loading platform that can be lowered
5. Shopping bags into car – a stretcher carrier with collapsible wheels, integrated shopping trolley
6. Flexibility – Disassembling the back of your car with a flexible weather shield (also suitable for camping)
7. Amorphous jelly on the back of the car that automatically grips the load
8. Securing net on seat belt tensioners
9. Multiple compartments – a whole network like computer bag storage
10. Volume of boot can be decreased with shelving and moving sides in
11. Back of car lifts up to accommodate unusual loads
12. Why not let the supermarket load your car?

### Team 2

How can the car itself surprise and delight customers – was the focus of this team's thoughts

## Appendix E: *Co-creation Workshop Transcript*

Types of Difficulties:

1. Physical
2. Climatic
3. Offspring
4. Load

Brainstormed ideas into the following categories:

1. First access
2. Organising space
3. Easy to clean
4. Access to shape

For each of these there were a various countermeasures.

Access

We would like the car to recognise us on a cold wet day and open itself.

It could just know us through a credit card key or there could be a button on the key fob.

It could even just lower the windows so that we could load the car like a bucket – drop it into the void of the trunk

Organising space

Flexible not just big – able to secure loads. Compartmentalised trunk?

Versatility and ease of cleaning

Importance placed on lifestyle – boots and bike in the back. We also want the vehicle to look nice inside.

Ability to hose down inside?

Look at the conflicts of storing dirty stuff and looking nice.

Bending and loading is an issue. Perhaps a pallet loading system could be used?

Note: Andy influenced creativity within the group during this activity. Is it because he knew all the constraints that exist now?

### Discussion 2

When a body of experts exist we tend to lean towards divergent thinking.

We need to remember that you cannot be critical during brainstorming – which is one of the rules.

Organisations can be very introvert by their nature, and by using empathic design as a way of bringing in a balance to convergent thinking.

Look at the power of video and getting into peoples' lives and getting it to senior managers and communicating that.

“It's powerful when you put it in front of people”

## Appendix E: *Co-creation Workshop Transcript*

### Task 4

Accelerators and brakes of implementing Empathic Design

### Team 1

Training and education / retrospective analysis

"The thing about teams is they tend to develop a hierarchy and the driver is the one which drives the design"

We've nothing to communicate objectives – research based thing.

Unify the picture

How you organise yourself and others (Structural things)

- Guide pathways
- Process
- Territorialism

Justification is important – proof of effectiveness

Access to users is very important. Must share this information with ALL members of the design team and all should understand it

### Voting

Educating isn't necessarily of designers by the whole organisation.

"It's about redressing the balance"

"I'm not worried about the effectiveness of the process it's about educating those non-critically involved in the design process, and what benefit it can be."

It redresses the introvert nature of organisations this inward looking mentality of thinking of 100 reasons why you can't do something.

They don't get out enough to see what the users are really doing. If it's a question of money....?

"It's the chiefs you've got to get to"

There are so many constraints imposed on a design by organisation that Empathic Design can go some way to redressing that balance.

If you can convince the guys at the top they can organise the structure

This needs to be a 'top down' process

Consensus is that proof of effectiveness seems to be most important

A change in structure would accelerate implementation

Acknowledgement that both are extremely important

## Appendix E: *Co-creation Workshop Transcript*

Note: They are discussing the chronological order of events

1. Prove effectiveness
2. Change structure

"You have to create hoops for managers to jump through before they 'buy in' – the question is how? Can we speed that up to improve the design process?"

### Presentation – Team 1

1. Proof of effectiveness including timing and communicating of benefit and way of working.

"Could use case studies, look at successes and use retrospective analysis

Justifying its use

2. Structure

The need to make organisational change – To speed up Empathic Design

- Problems with large design teams
- Territorial issues
- Imbalanced structure – I.e. cost down inhibits Empathic Design
- Open mind = important
- Objective setting and team working = Ace
- Central monitoring

Set major objectives early

- Good customer data
- Need knowledge about users
- Good access
- Good definition of needs

Careful choice of project champion within the organisation

### Team 2

1. Open mind – A willingness to accept
2. Value creation potential – Effectiveness
3. Awareness of Empathic Design
4. Immersing the designer in the User Experience and Time to understand
5. Communicating between designers – Particularly managers

Note: Both teams were basically similar

"How do you persuade organisations?" – It must be your first priority?

Open mind is a fundamental quality

We need freedom to do this, but we also need to prove effectiveness. We can't prove effectiveness without freedom.

Do you have to prove effectiveness statistically, perhaps even in financial terms?

## Appendix E: *Co-creation Workshop Transcript*

"You will surely have to demonstrate commercial merit in order to demonstrate that it's worth pursuing".

"You don't need spreadsheets because managers know what they're not successful at."

Use small experiments/pilot studies?

Managers often aren't customer-driven

Connect with high level champions/sponsors

Note: Tools used in this workshop may be able to do this

Empathic Design as it stands doesn't generate fear or ambition within organisations

To kick-start companies you either need competitors or customers to do something that sparks fear or ambition.

Companies want differentiation.

Empathic Design could be common sense

The aim of the workshop is to realise innovation by allowing designers to empathise with real users in real environments and engage with other designers within the framework of the workshop. The workshop will follow a format containing four elements; 2 discussions regarding empathic design, designers' perception of it and its application, and 2 interactive elements where designers will be allowed to 'practice' empathic design in response to stimulus relating to 2 real products, one of which will be a NISSAN car. We are writing to Electrolux to find out if you wish to suggest another user-oriented product. The benefit of such an approach is that you may gain unexpected design ideas as well as learning from the general process.

We would like to take this opportunity to invite a designer from Electrolux to participate in this event. We hope designers will gain product ideas through experience and reflect upon Empathic Design-orientated approaches to capturing the 'voice of the customer'.

With this in mind we would also like to invite Electrolux to provide the stimulus material for one of the interactive elements of the workshop. We would be happy to assist with the preparation of this material, though we anticipate that Electrolux will already have much if not all of the material within easy reach. The stimulus will include multimedia information (Video, photographic, Audio, tactile information) relating to the product context, use, tasks performed and user problems. Designers will be allowed freedom of interpretation of this information. Realising that some more recent information of this nature may be sensitive to Electrolux, the stimulus that you provide may be some years old, though I am sure you can appreciate that with more recent information, the feedback will become more relevant.

It is our hope that this stimulation will not only give the participants an insight into the innovative design thinking of their peers, but will also generate innovate solutions to REAL needs surrounding REAL products.

Please find attached a copy of the draft agenda and a copy of our initial thoughts regarding invitations to this event.

Yours Sincerely

Richard Barrett



## Workshop Programme

0900	<i>Arrival and Coffee</i>
0930	<i>Welcome and Introduction to Empathic Design Workshop</i>
0940	<i>Interactive Element of workshop 1 – working with a NISSAN product</i> <i>Stimulus: Product in Use</i> <i>Scenario of Use Workshop Information</i> <i>Context of Use</i> <i>Varied Environments and Conditions</i> <i>Varied tasks</i>
1100	<i>Break</i>
1115	<i>Discussion – The perception of Empathic Design</i>
1230	<i>Introduction to Afternoon Sessions</i>
1245	<i>Lunch</i>
1345	<i>Interactive Element of Workshop 2 – working with OTHER product (Electrolux)</i> <i>Stimulus: As provided by Electrolux (as close to NISSAN as possible)</i>
1500	<i>Break</i>
1515	<i>Discussion – The application and integration of Empathic Design</i>
1645	<i>Reflection</i>
1700	<i>End</i>

- Product in Use – Highlights product use behaviour through observation. This can be either broad or specific.
- Scenario of Use Workshop – Role-play surrounding a real person's car use that allows designers to interact with customers in real-time to generate need statements and potential solutions.
- Context of Use – Information regarding the wider implications of a product or solution when in use.
- Varied environments and conditions – highlights many of the environments in which the product may be used and looks at extreme conditions under which the product may be used or misused.
- Varied Tasks – Highlights user-oriented tasks that may be performed using a product or solution.

**Draft Invite List**

You will, of course have the opportunity to veto any potential participant invitation so I am enclosing a draft list of possible attendees. Please feel free to make any recommendations.

## Automotive

- *Swift Caravans*
- *Aston Martin*
- *Lotus Bentley*
- *Norton*
- *Piaggio*
- *Taxi (Metrocab)*
- *LDV*
- *Scania*
- *Other small British automotive manufacturers?*

## Outdoor Leisure

- *Boat and/or Jet ski design*

## Outdoor Equipment

- *Karrimor*
- *Berghaus*
- *North Face*
- *Lowe Alpine*

## Home Electronics

- *Bang & Olufsen*
- *Samsung*
- *Electrolux*

## Telecommunications

- *Nortel*
- *Eriksson*

## Child learning and toys

- *Vtech*
- *Mattel*
- *Bandai*
- *Hasbro*
- *Tomy*
- *Fisher Price*

## Related Design

- *Web Designers*
- *Architects*
- *Interior Designers*

## Personal Computing

- *Psion*
- *Microsoft*
- *Software designers*

## Individual Ability related design

- *Multi-Sensory Environments*
- *Motability (Stan Oliver)*
- *Communicate (Phil Gardner)*
- *DEMAND (Ron Currell)*

## Customer Service

- *Virgin Atlantic - Customer Service Design*
- *ICL*
- *Mondex (Swindon)*

## CUPID

The CUPID project is a collaboration between Cranfield University, NISSAN European Technology Centre (NETC) and MIRA (Motor Industry Research Association). CUPID focuses on identifying and interpreting the latent needs of people whilst using products in context.

### Empathic Design

The practice of Empathic Design Integrates the 'voice of the customer' into the design process and involves bringing together information regarding those who have needs and the people who have the ability to generate solutions for those needs. Empathic Design encourages designers to recognise occasion and mood as well as product and problem by co-operating with users by intervening into individual practices of living.

It is intended as an additional compliment to current research methods though it is true involvement with users in context that allows designers to focus ideas and solutions on real users.

### Current Involvement with Empathic Design

The CUPID project is already using Empathic Design to influence concept design stages of real products within NISSAN. There is opportunity for CUPID to influence the design of domestic appliances within Electrolux.

### Why Electrolux?

We feel that:

- Electrolux have an open-minded approach to design
- Electrolux like to learn from others
- Electrolux will respond positively to this approach to design thinking
- We have a good relationship with Electrolux

### Workshop

We are planning to host a proactive workshop here at Cranfield University as part of the CUPID project, based around the concept of Empathic Design. The aim of the workshop is to realise innovation by allowing designers to empathise with real users in real environments through the use of stimulus material and facilitators, and engage with other designers within the framework of the workshop.

- Proposed Date - Week commencing 6<sup>th</sup> September 1999

The workshop actively involves designers in the practice of Empathic Design and encourages them to interpret needs rather than modify a product.

### What will be gained from the Workshop?

- Understanding of Empathic Design by Designers
- Allows designers to focus on real users in context
- See how other designers interpret and use Information
- Allows designers to feed off each other
- Allows reflection upon Empathic Design orientated approaches
- Recorded needs and solution ideas that have been derived during the course of the workshop

### What will the Outputs be?

- Video recording of the workshop
- Generated statements of needs surrounding one Electrolux and one Nissan product
- Solution ideas regarding those needs

### What is expected from Electrolux (by 1<sup>st</sup> August 1999)?

- Confirmed Product Selection (dishwasher)
- Reports on that product (dishwasher)
- List of users - if possible but not necessary

Cranfield University – *Richard Barrett, Andrew Burns, Stephen Evans, Catarina Johansson*  
NISSAN European Technology Centre – *Paul Garside*  
MIRA Motor Industries Research Association – *Roisin Hopkins*

- Any support material (one or two large drawings of the product)
- Any potential attendees (that Electrolux would particularly like to invite or would object to)

Costs to Electrolux

- Maximum of 2 designers for 1 day (at Cranfield University)
- Time to assist in preparation of support material (approve the preparation of support material by Cranfield University)
- No direct financial cost

Material to be prepared by Cranfield University for Electrolux

Video or photographic material regarding:

- Products being used in context
- Scenarios of use regarding product
- Conditions of use
- Environments that the product is used in

What Happens after the Workshop?

- We hope that this workshop will become a regular event
- There may be scope for Electrolux involvement with the CUPID project
- Further use and understanding of Empathic Design

Where does CUPID and Electrolux go from here?

This workshop is not designed to 'sell' CUPID. However, if you feel that following the workshop there are avenues that Electrolux wish to explore or areas that you found to be particularly interesting then we would be more than happy to take discuss them further.



**six areas of interest**

---

My first appliance

Apartment appliances

Family sized

Premium


Profesional

Other locations  
(appliance to furniture)

## Appendix F: *Main Study – Aspect 3*


### Home appliance project > march 2002



samsung design europe 

### Home appliance project > march 2002



samsung design europe 

## filters

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is it Samsung

1-5 years

is it appropriate

no blue sky

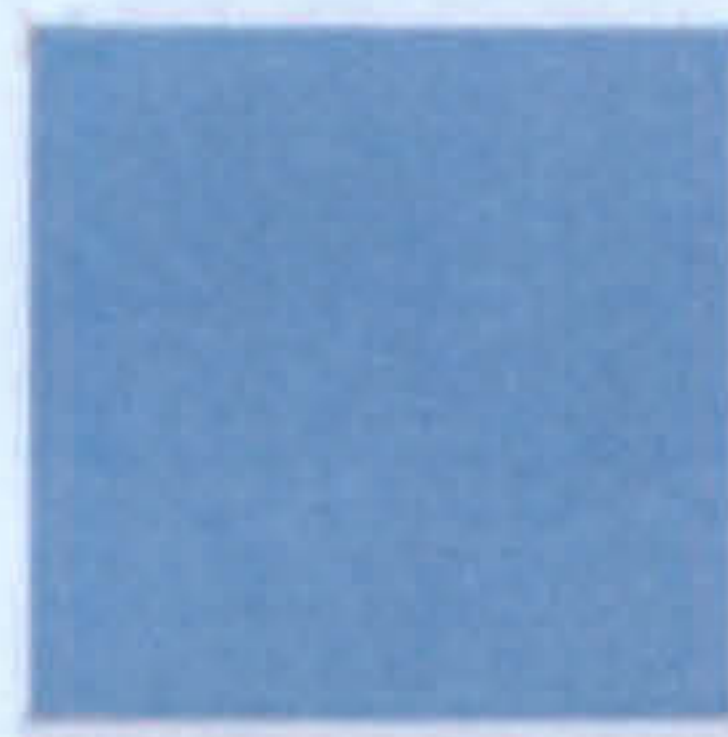
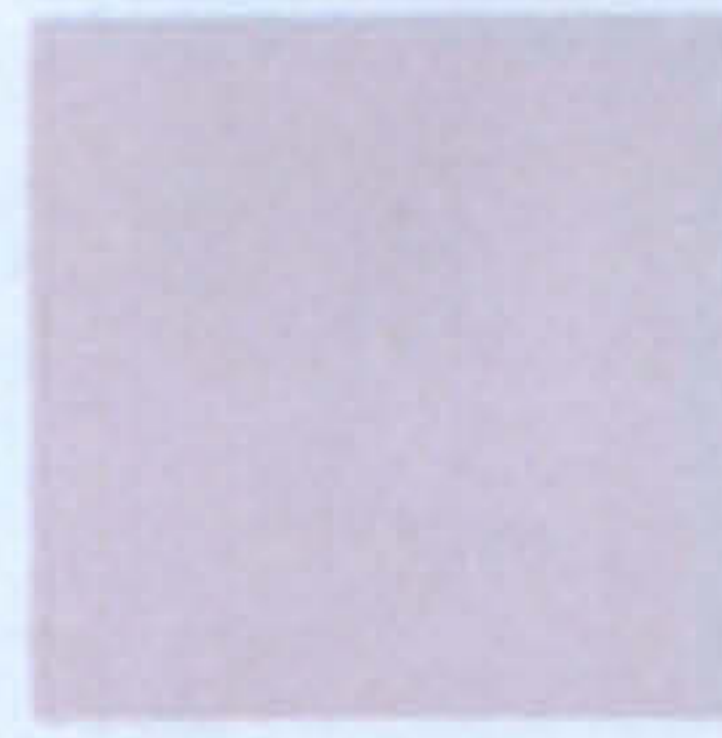
new business area

My first appliance > 0.1

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> Good cheap products

> Cheap products dont have to be crap!



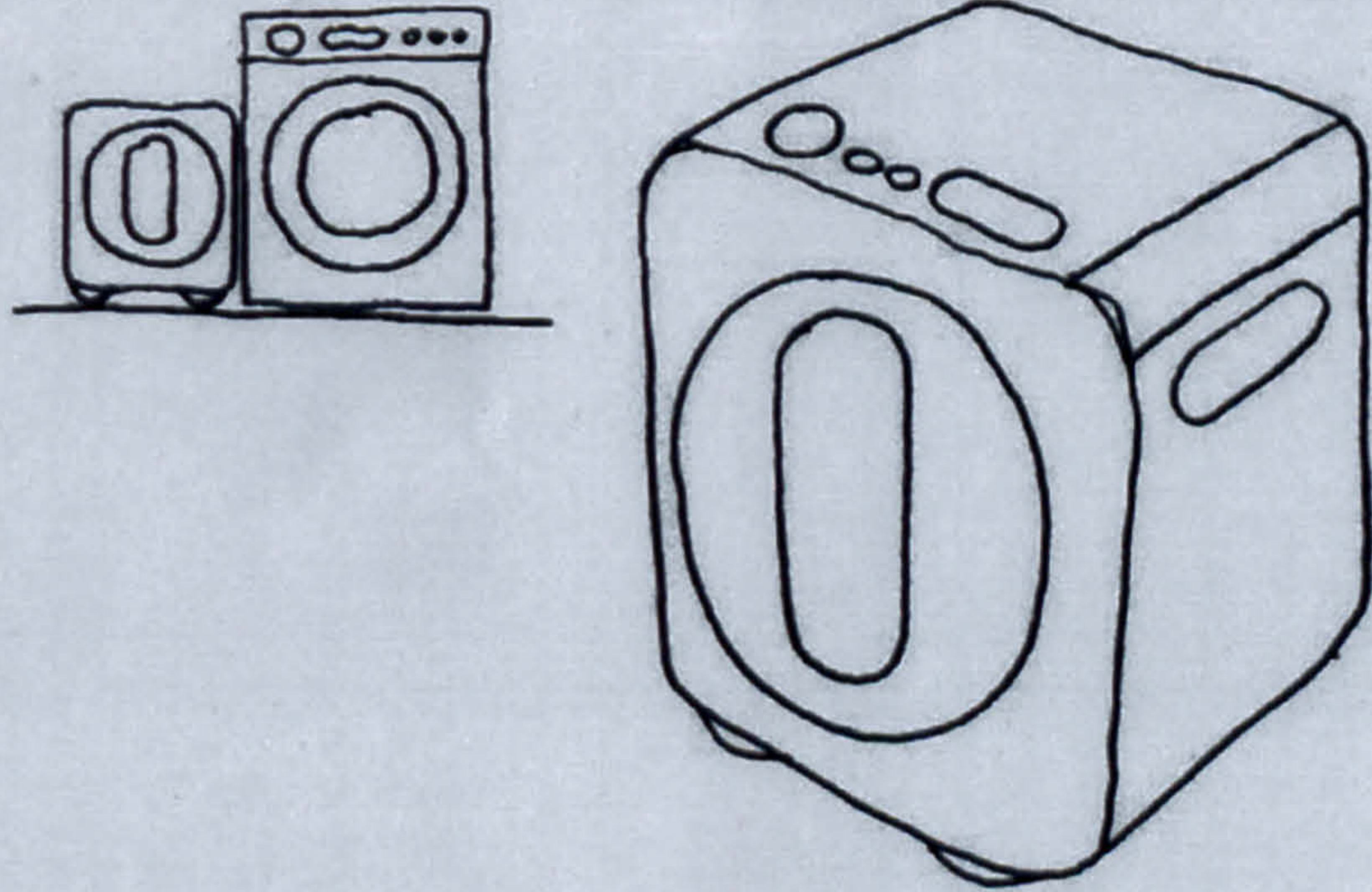
my 1st appliance > Washing Machine. A

**needs**

smaller compact washing machine for single person/ small apartment.

**opportunity**

- > smaller drum
- > stronger design language
- > integrated handles, transportable



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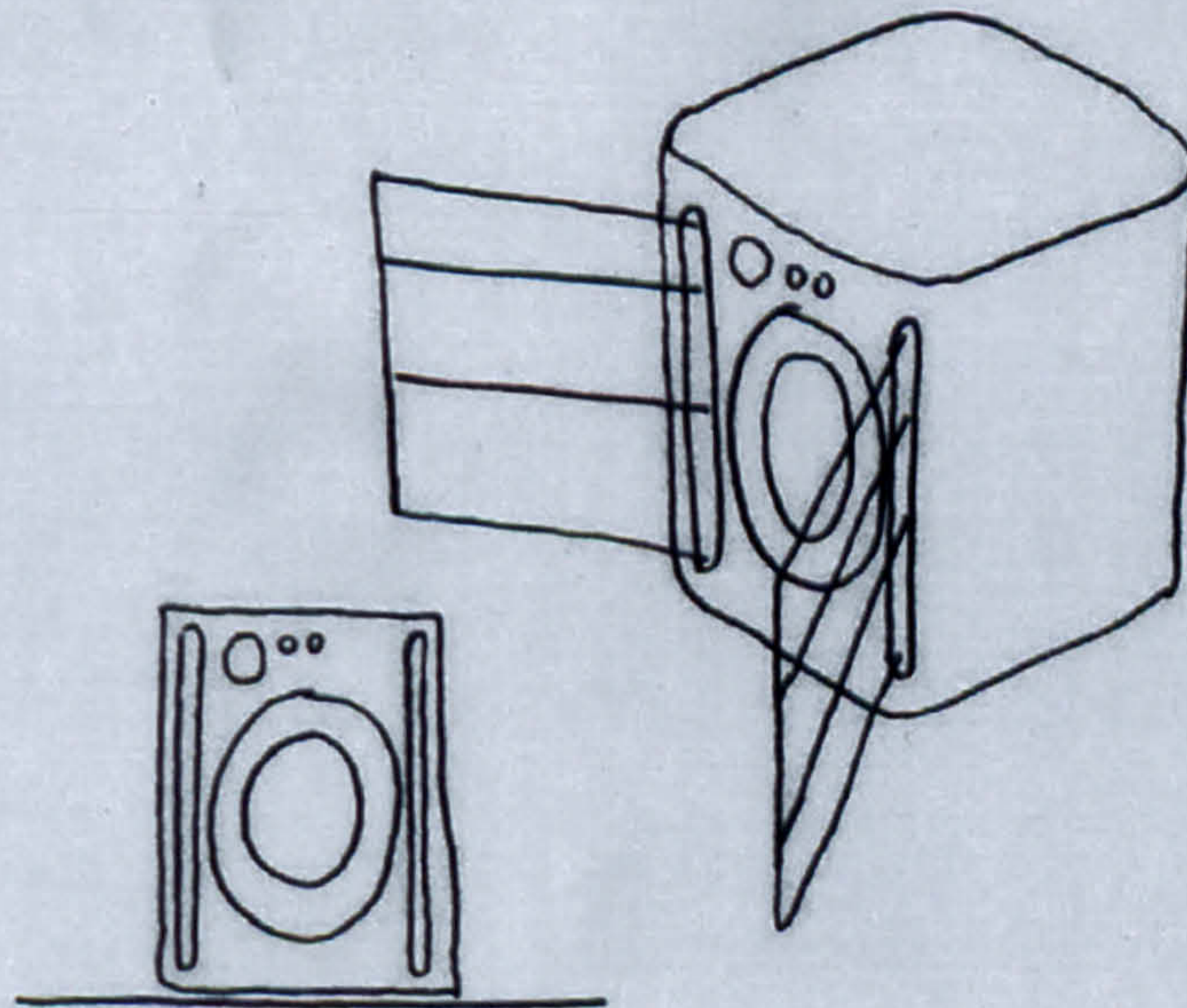
my 1st appliance > Washing Mashine. B

**needs**

space saving, integrated, total solution for small apartment

**opportunity**

- > integrated sliding cloths frames
- > warm air blowers out of slots to dry cloths quicker



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my 1st appliance > Washing Machine. C

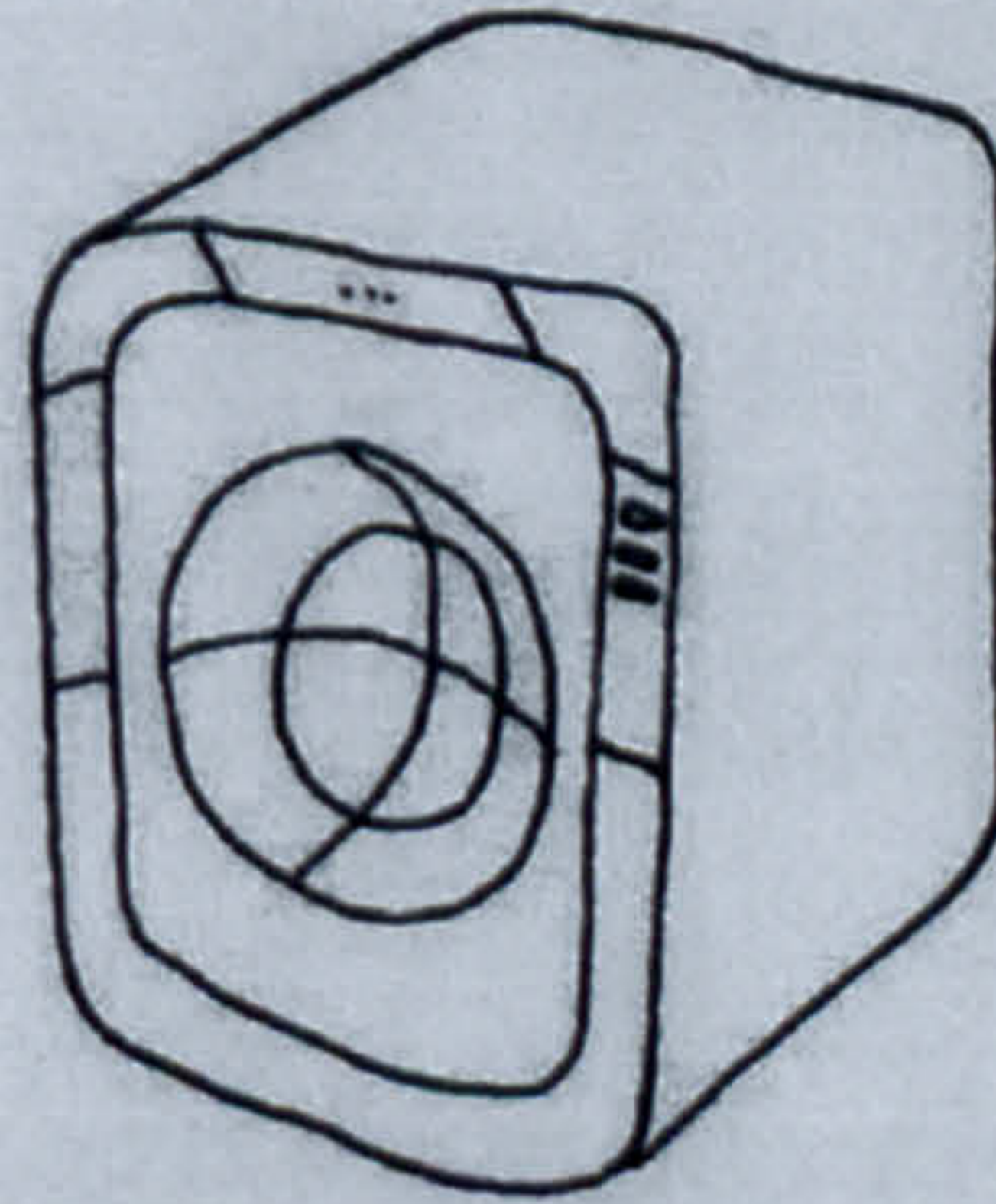
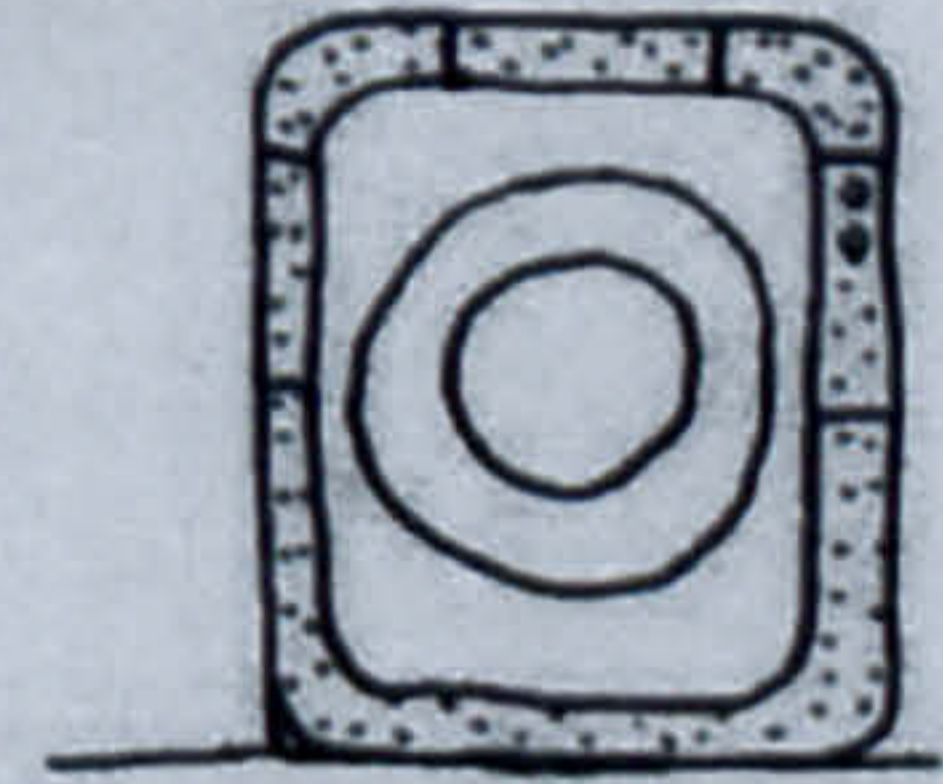
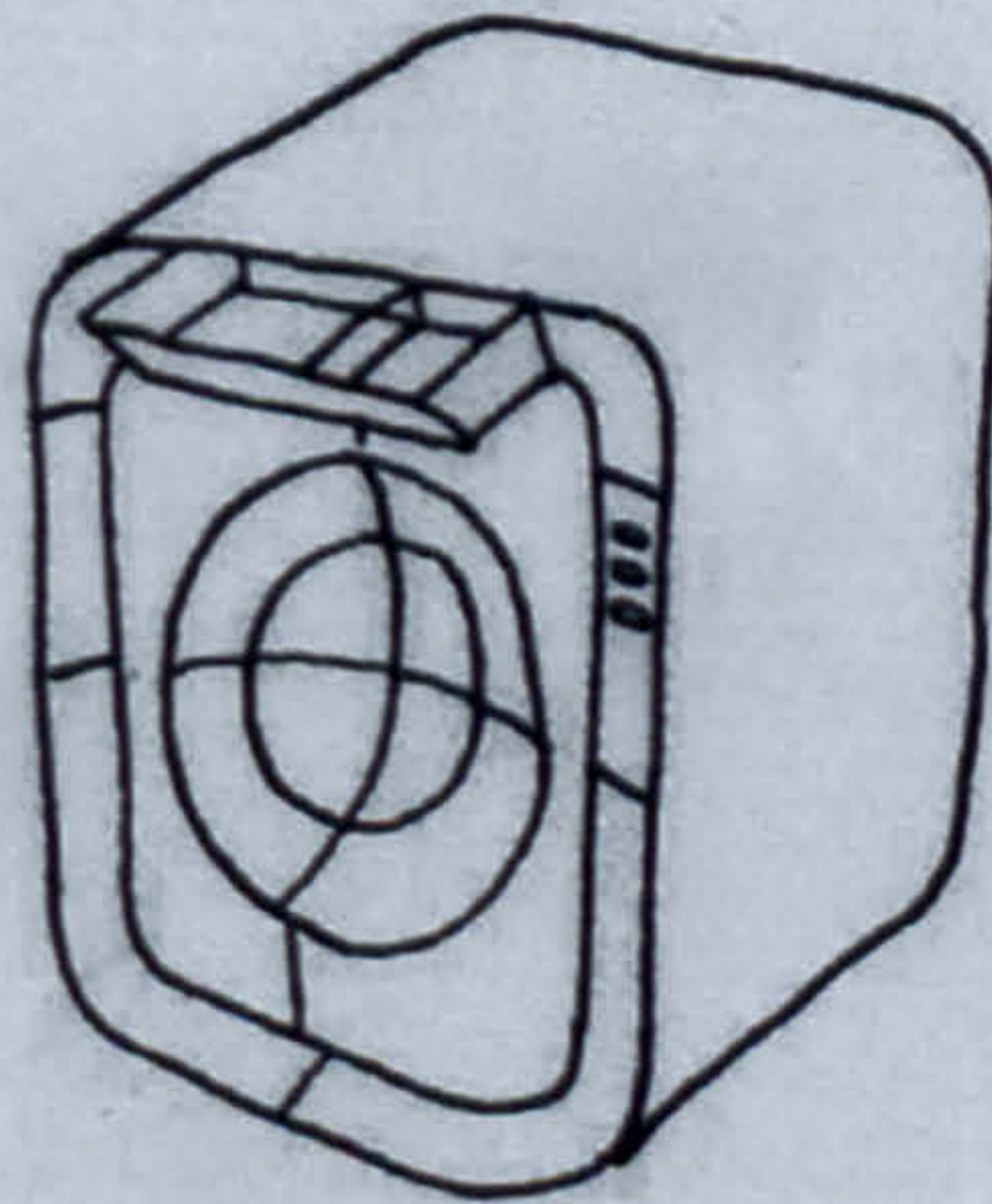
**needs**

contemporary design with basic functionality

**opportunity**

> integrated control panels and powder tray into wrap around element

> design driven solution



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my 1st appliance > Washing Machine. D

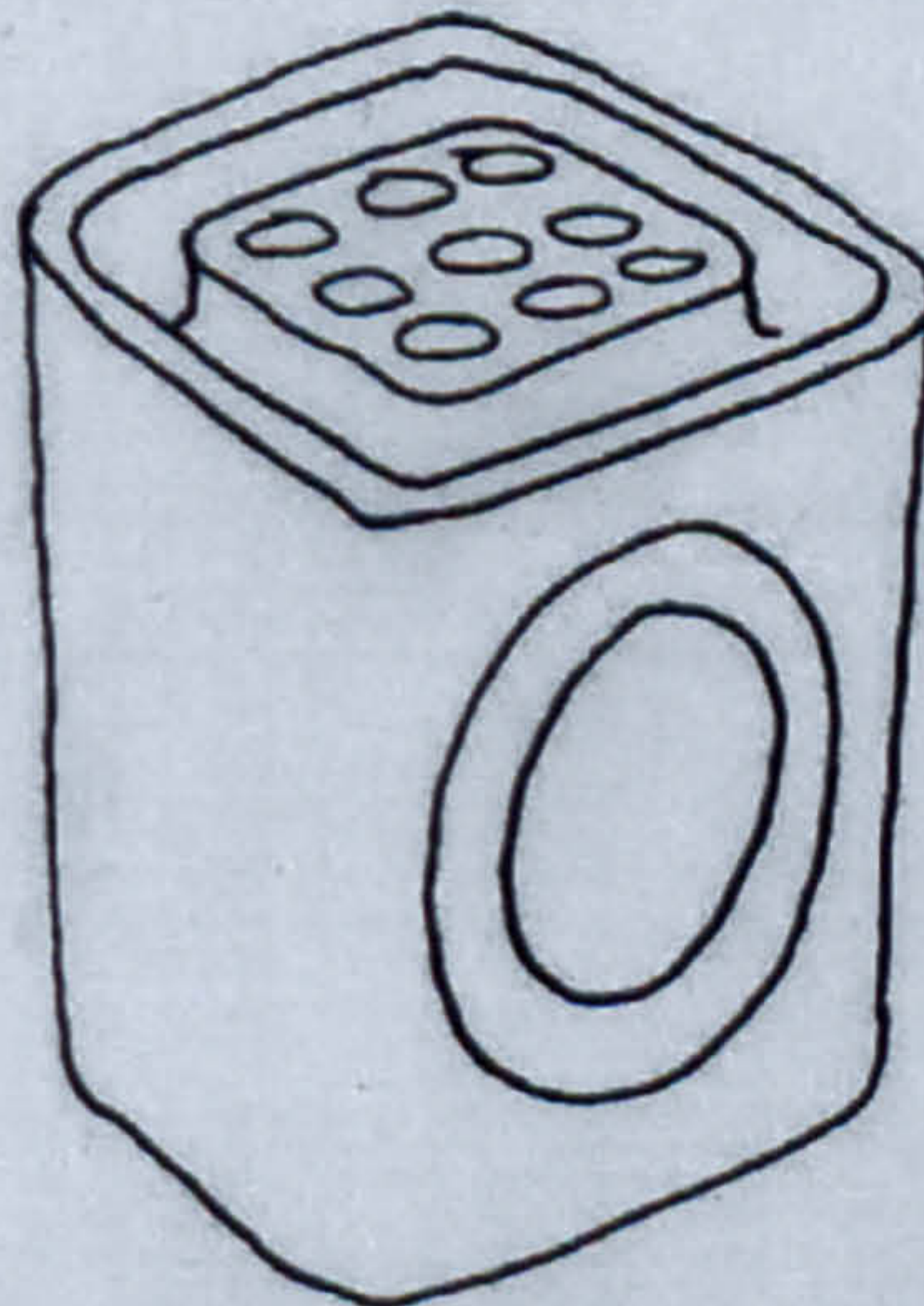
**needs**

space saving solution, integrated cloths dryer

**opportunity**

> integrated cloths hanger

> warm air blower for faster drying cloths



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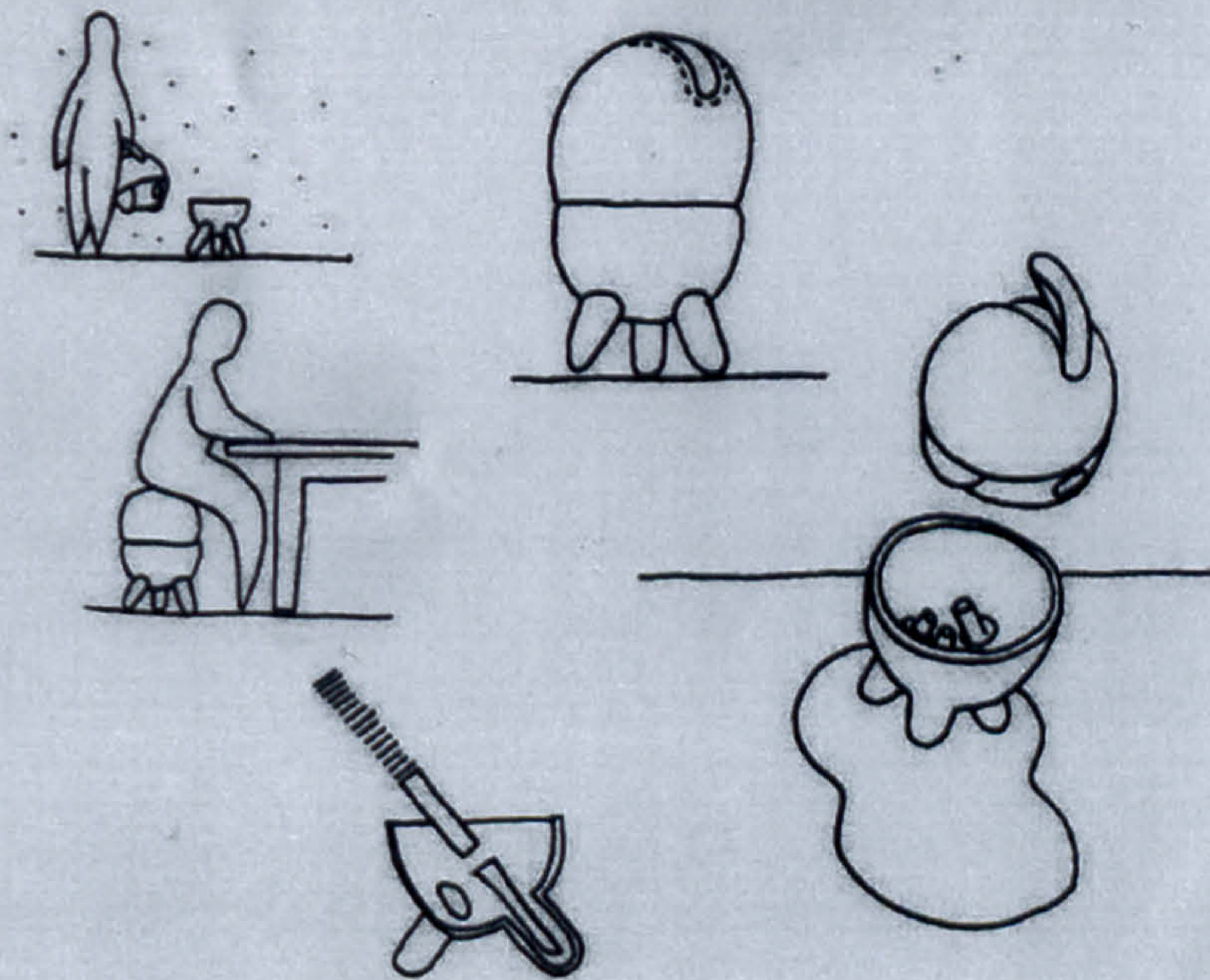
my 1st appliance > Vacuum. A

**needs**

no space for storing vacuum

**opportunity**

- > vacuum left out and becomes stool
- > legs of stool are storage for tools
- > stool base hides large wheels on vacuum



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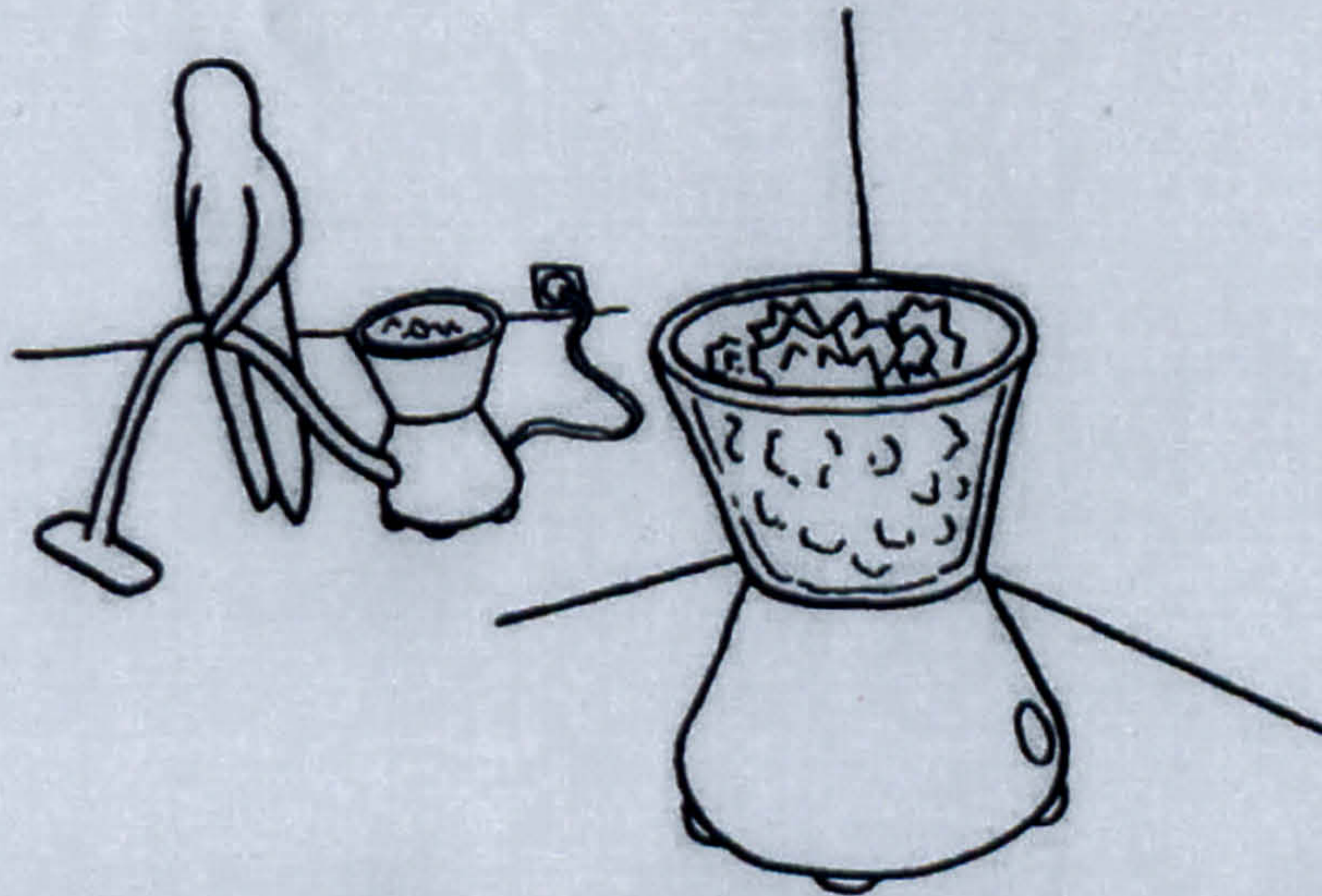
my 1st appliance > Vacuum. B

**needs**

no space for storing vacuum

**opportunity**

- > vacuum stays out and is also used as a waste paper basket
- > handy bin to throw waste into while vacuuming



samsung design europe GRO

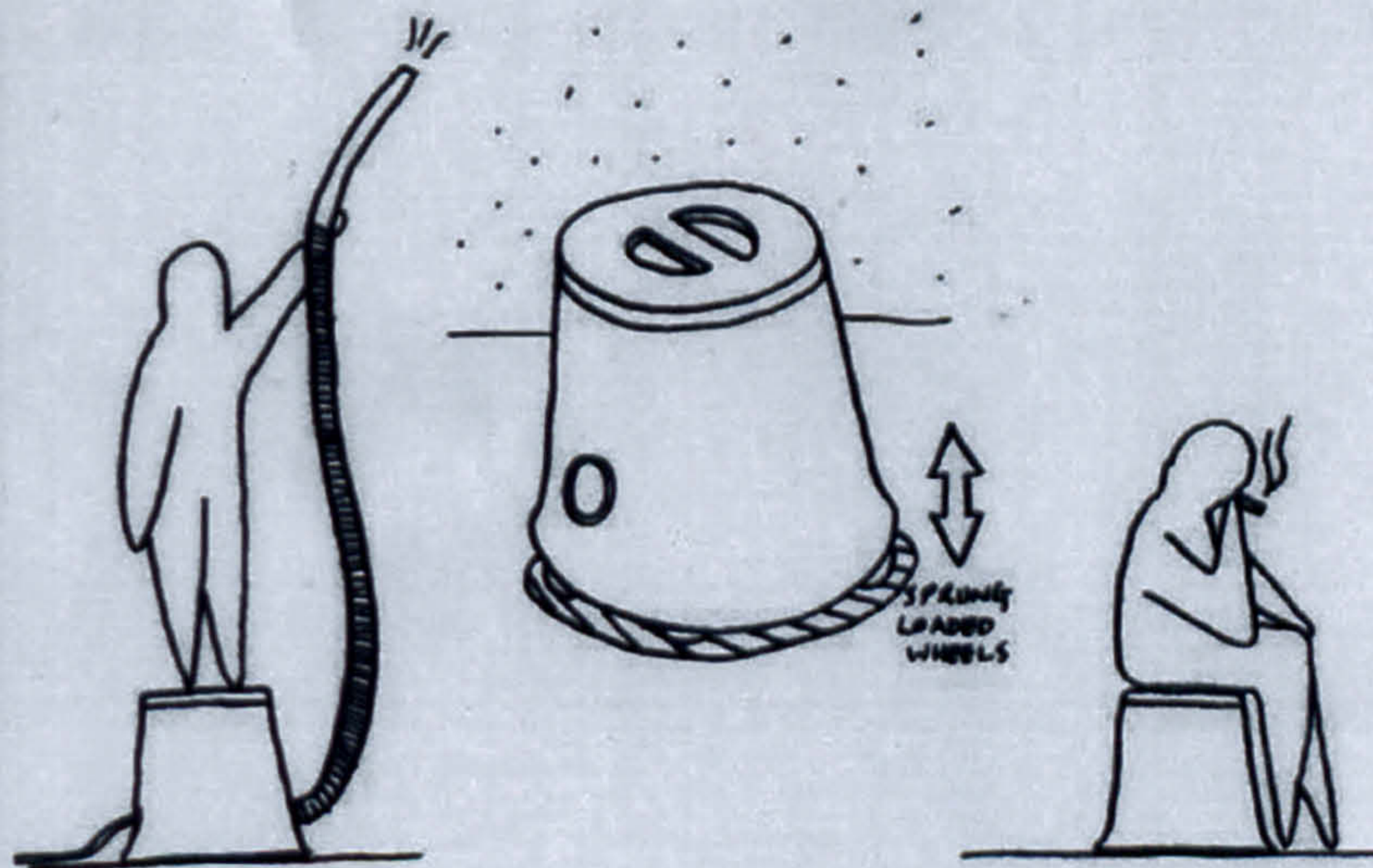
my 1st appliance > Vacuum. C

**needs**

no space for storing vacuum

**opportunity**

- > vacuum plus 'kick-step'
- > sprung wheels retract when sat or stood on
- > ideal to stand on to vacuum cobwebs from ceiling
- > handy stool



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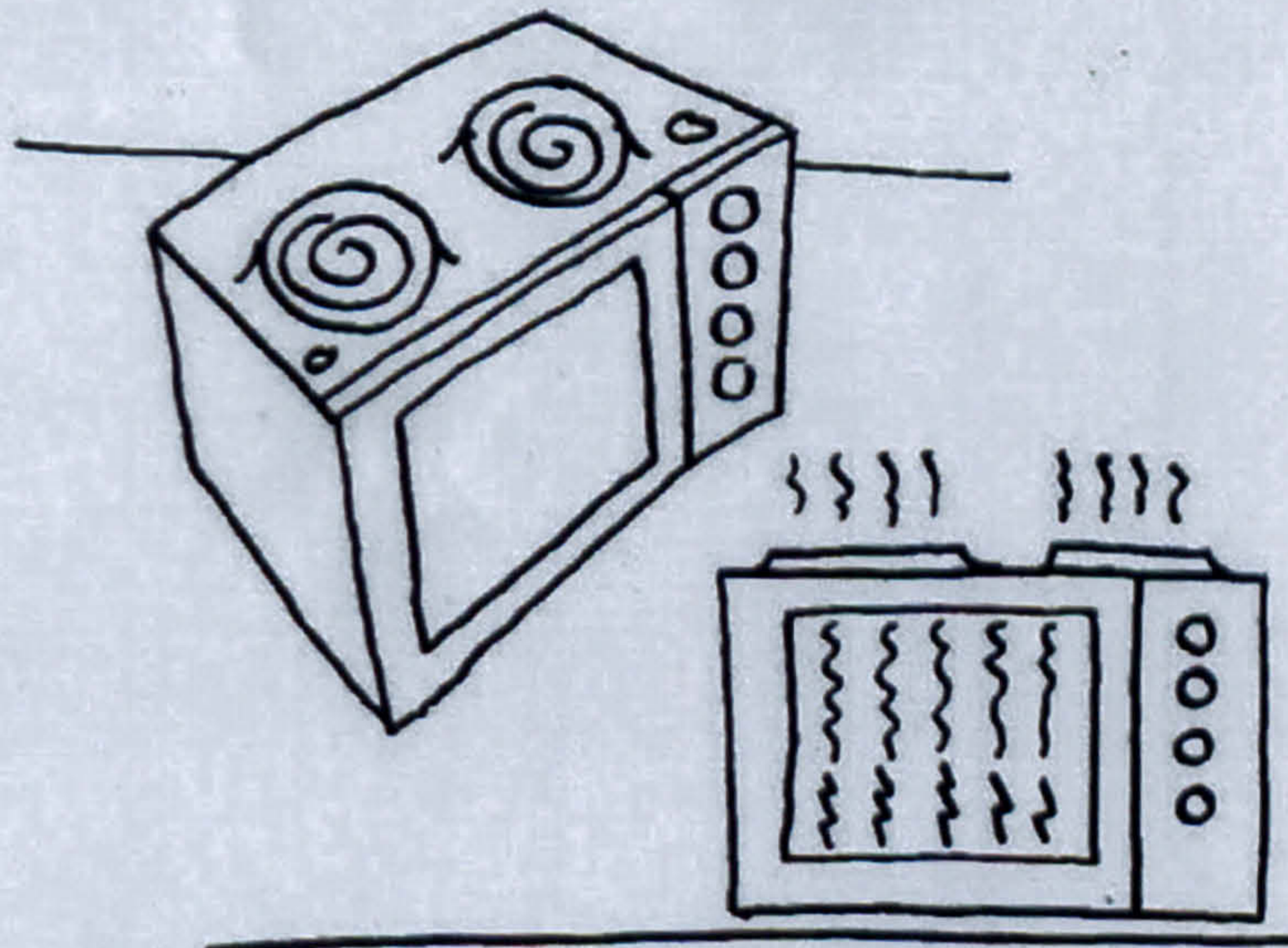
my 1st appliance > MWO. A

**needs**

complete cooking solution.

**opportunity**

- > combination MWO, convection oven, grill and hot plates
- > space saving
- > one purchase



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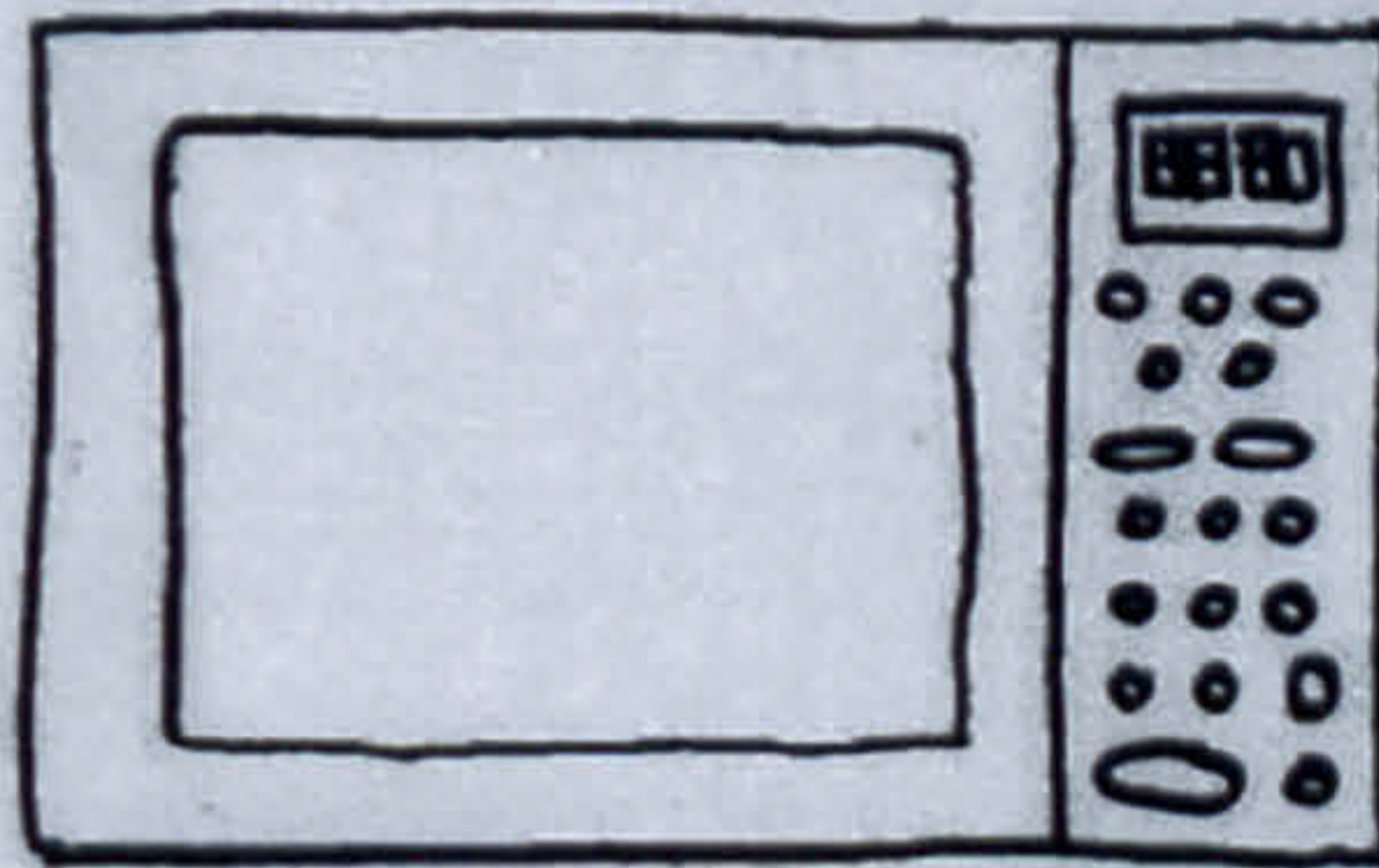
my 1st appliance > MWO. B

**needs**

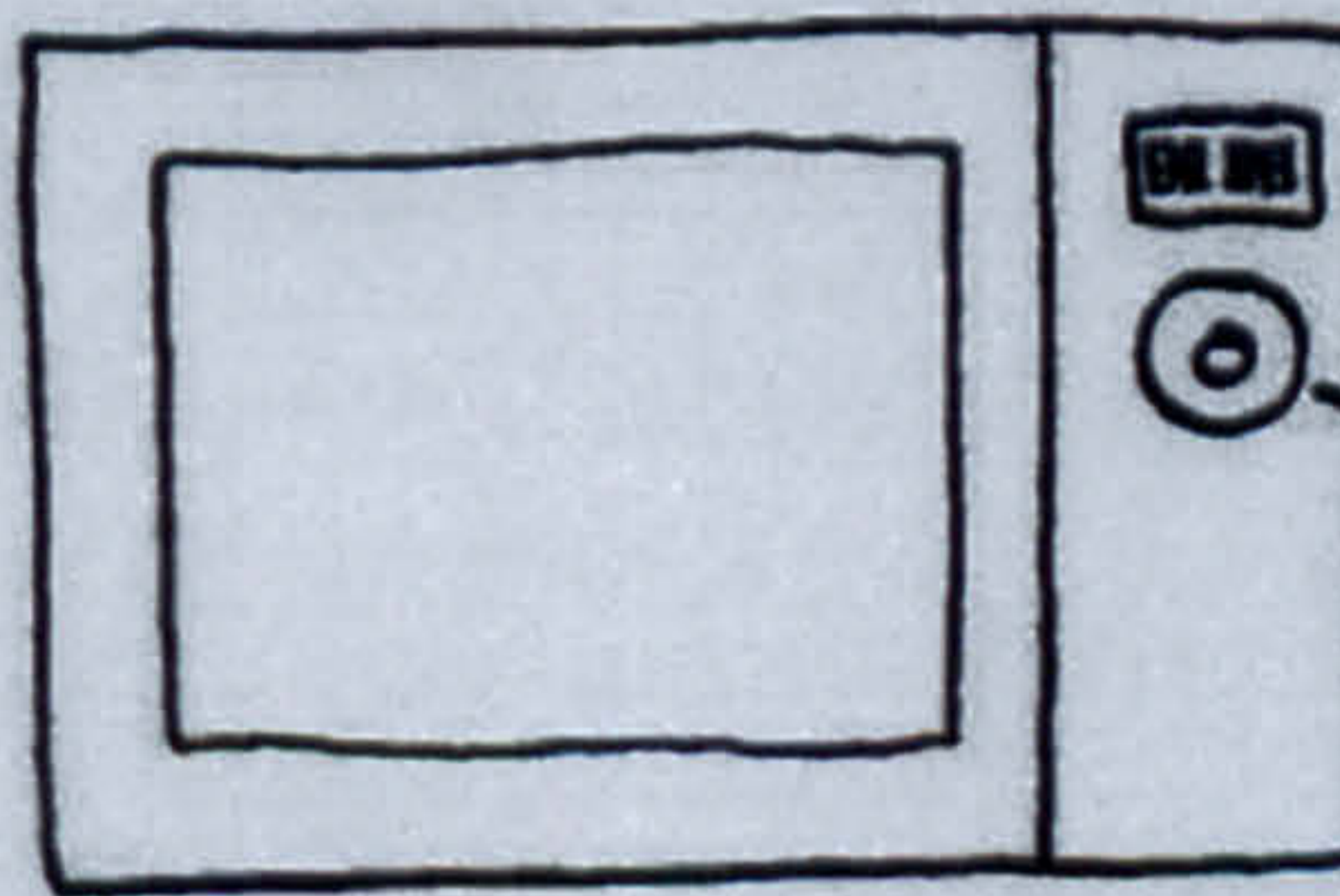
simple and basic user interface

**opportunity**

- > remove all unnecessary features and functions
- > 'one button' interface
- > layered U.I



TODAY .



TOMMOROW

samsung design europe GBO

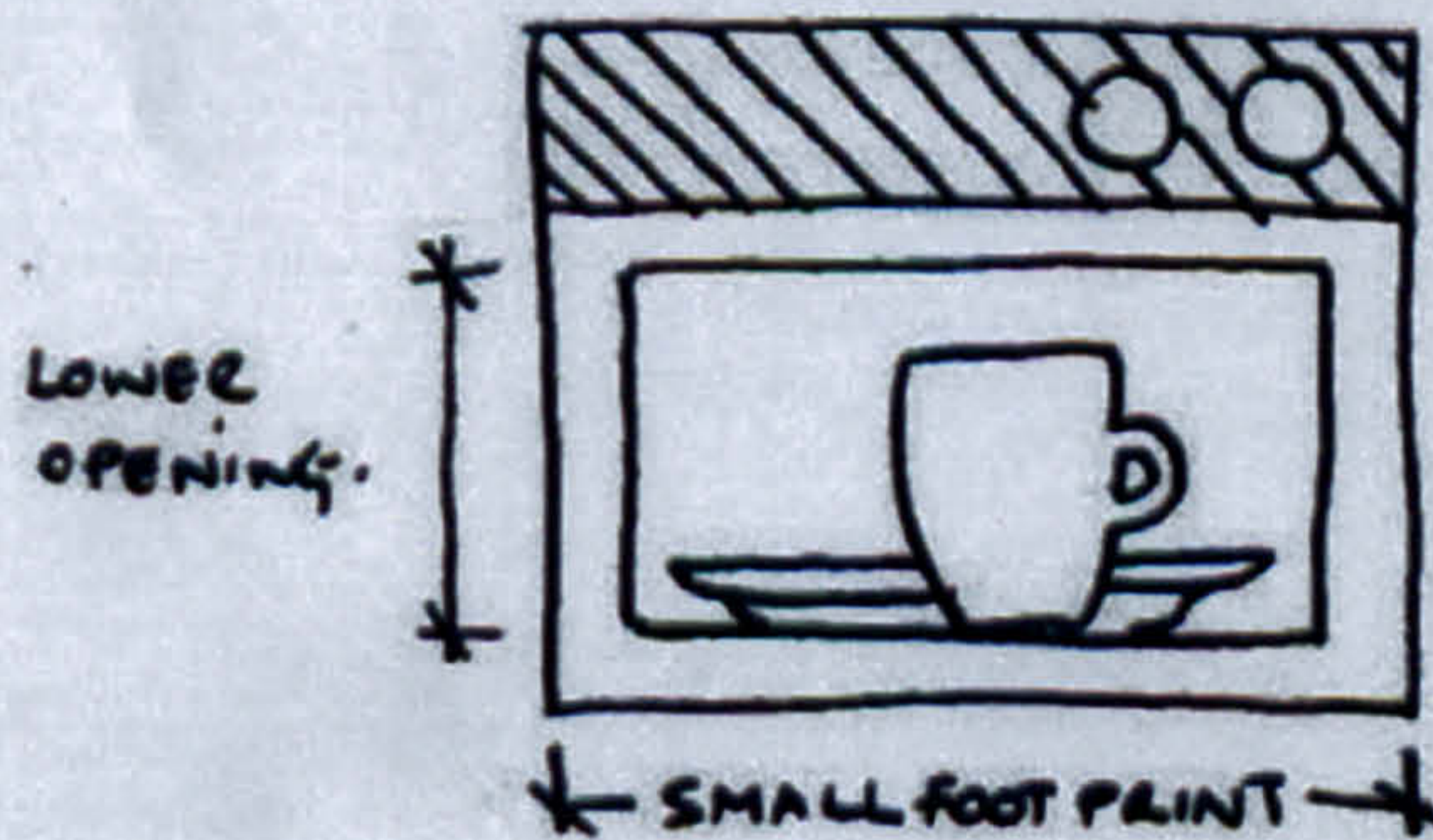
my 1st appliance > MWO. C

**needs**

small foot print, large capacity MWO

**opportunity**

- > move cptrls and components to top or bottom of MWO



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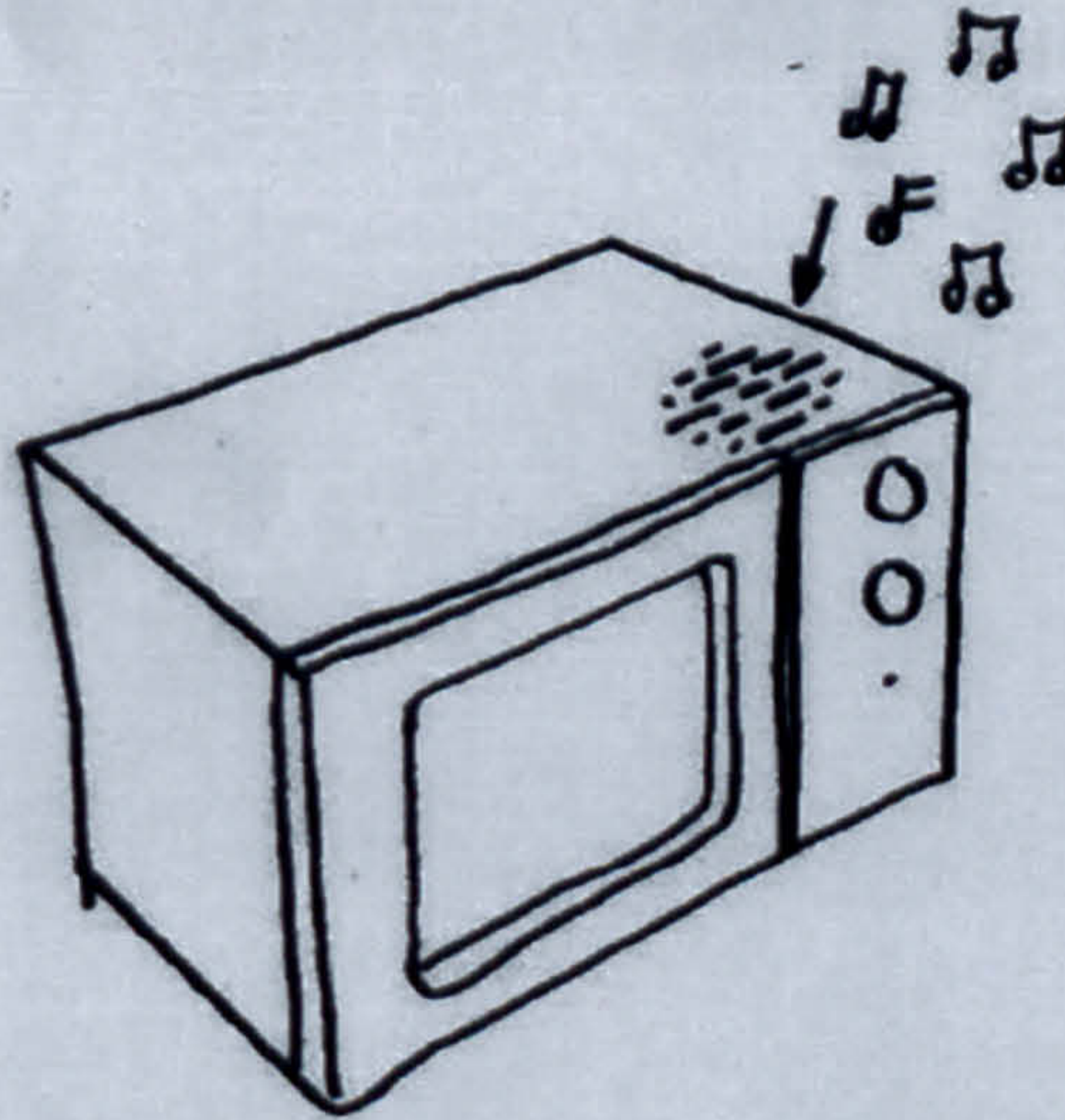
my 1st appliance > MWO. D

**needs**

more fun and personal product

**opportunity**

- > integrate sound chip from mobile phone to choose sounds
- > digital sound recorder for your own sounds 'oi dinner's ready'



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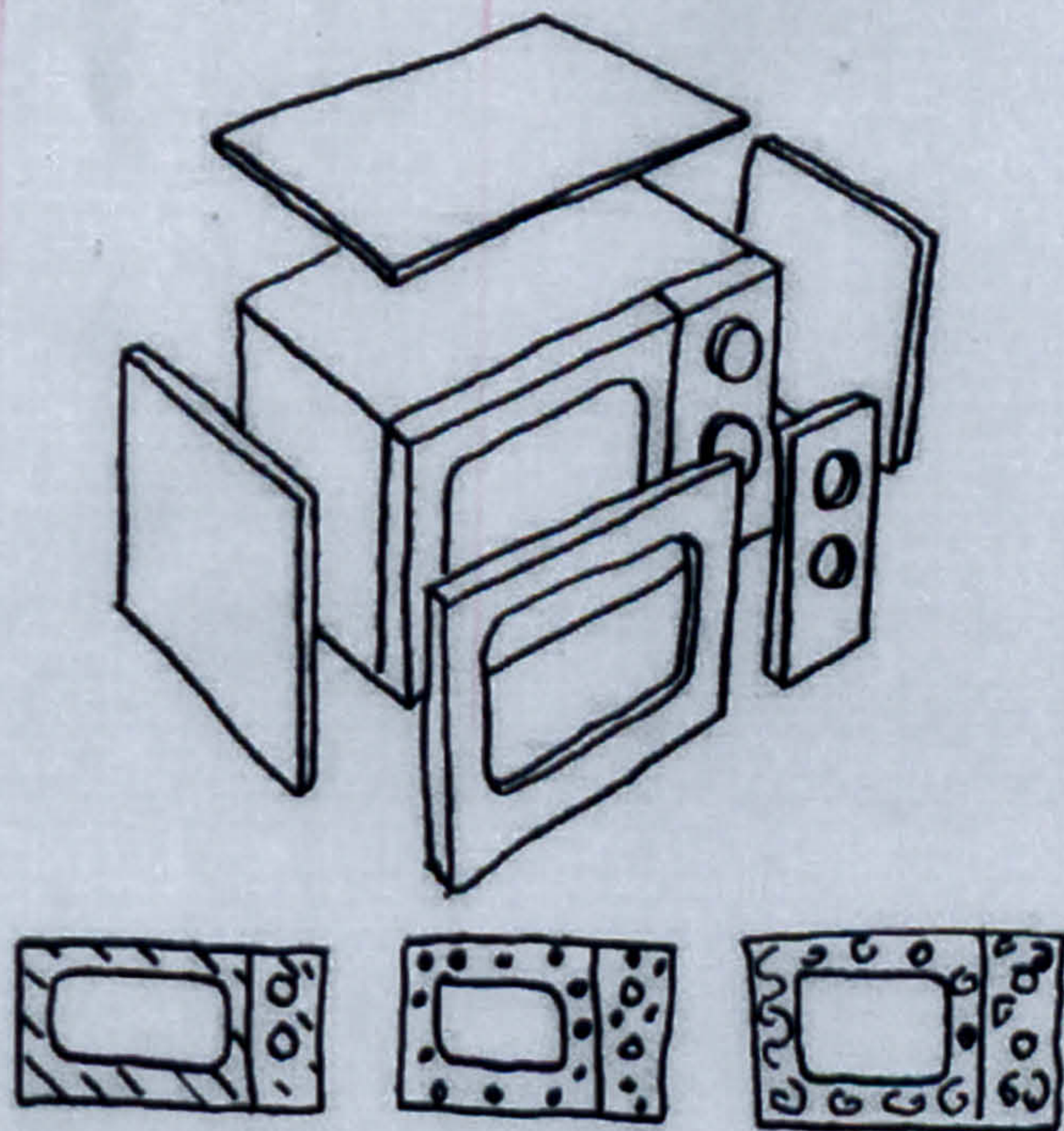
my 1st appliance > MWO. E

**needs**

personalisation and integration within kitchen

**opportunity**

- > young people - funkier taste
- > simple panels in variety colours
- > other materials, plywood, aluminium, formica
- > cooperation with ikea type distributor



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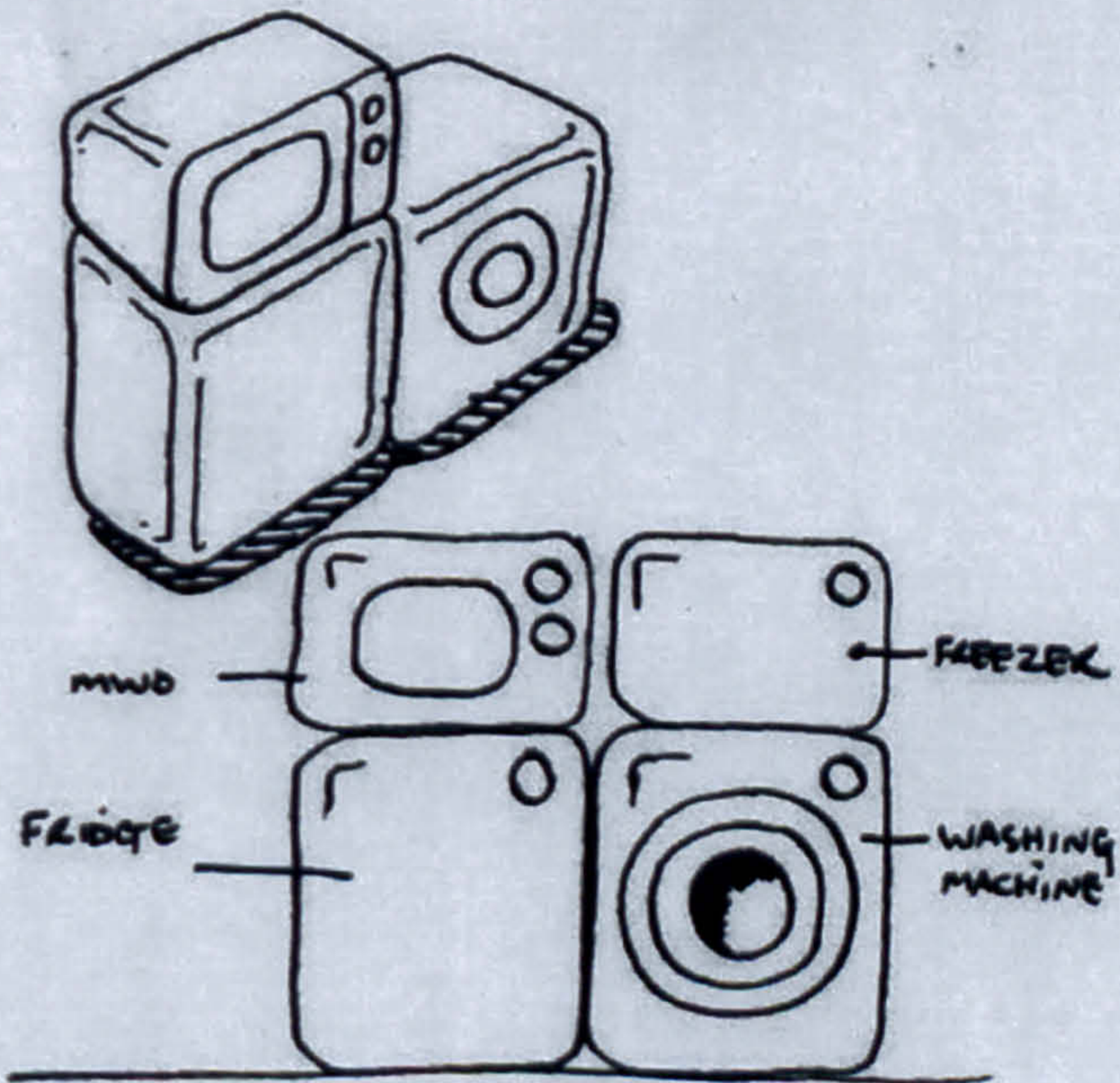
my 1st appliance > MWO. H

**needs**

appliances that work together or apart

**opportunity**

> simple 'pod-like' forms



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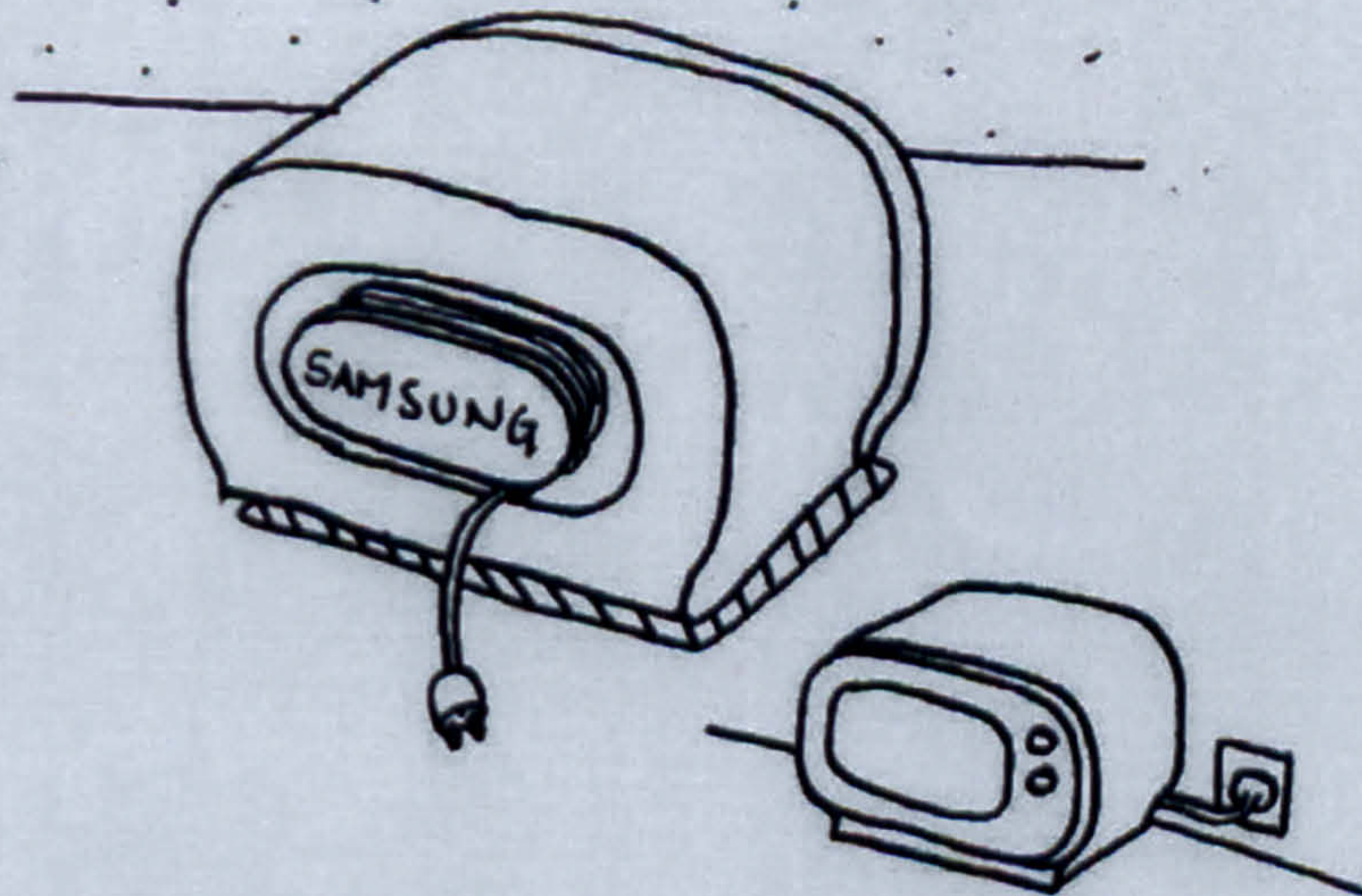
my 1st appliance > MWO. I

**needs**

excess cable looks very untidy particularly for free standing appliances

**opportunity**

> 'designed' cable storage solution



samsung design europe GRO

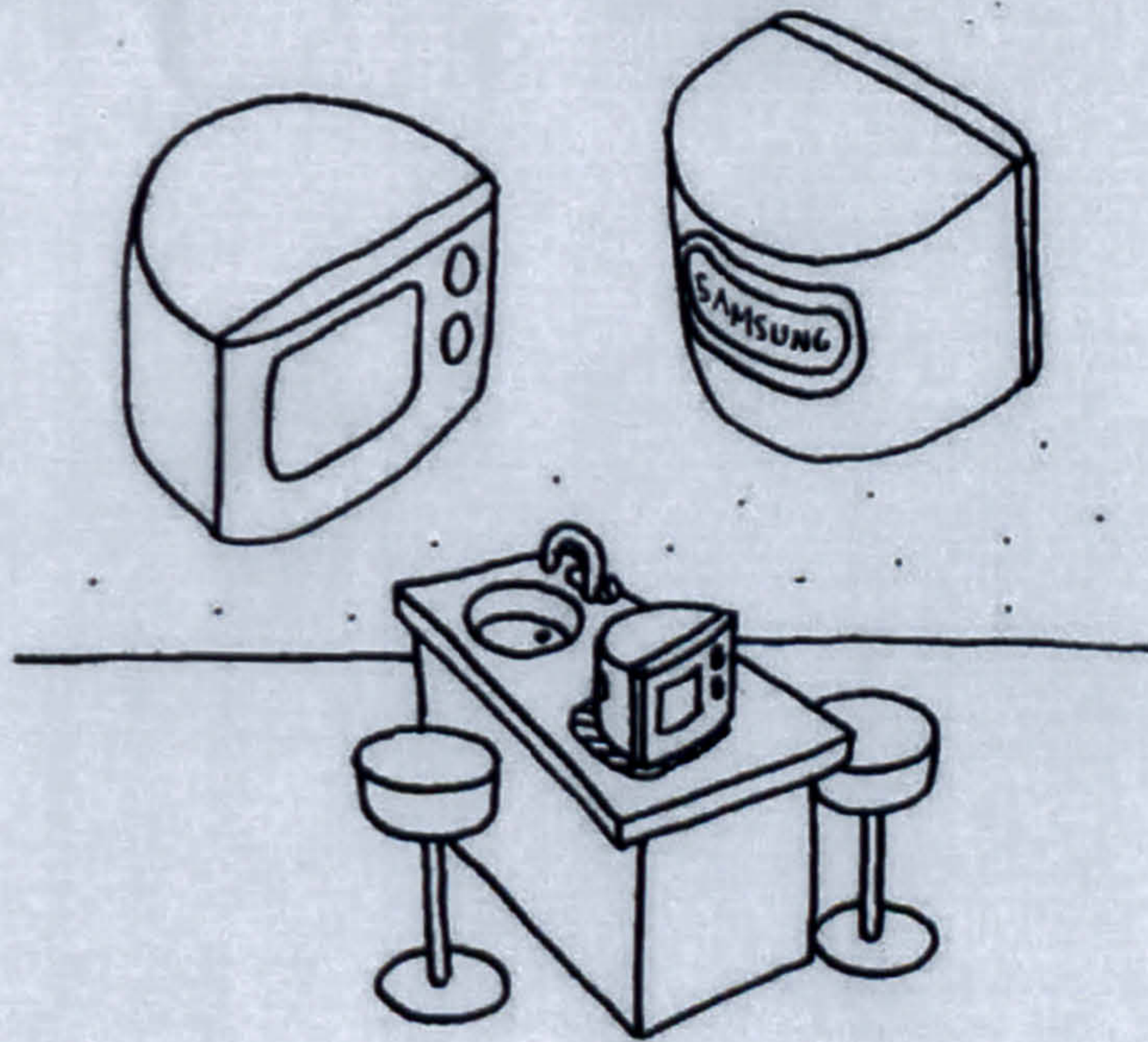
my 1st appliance > MWO. J

**needs**

free-standing appliances need to look good from all angles

**opportunity**

- > design a 360° product
- > gives complete new look



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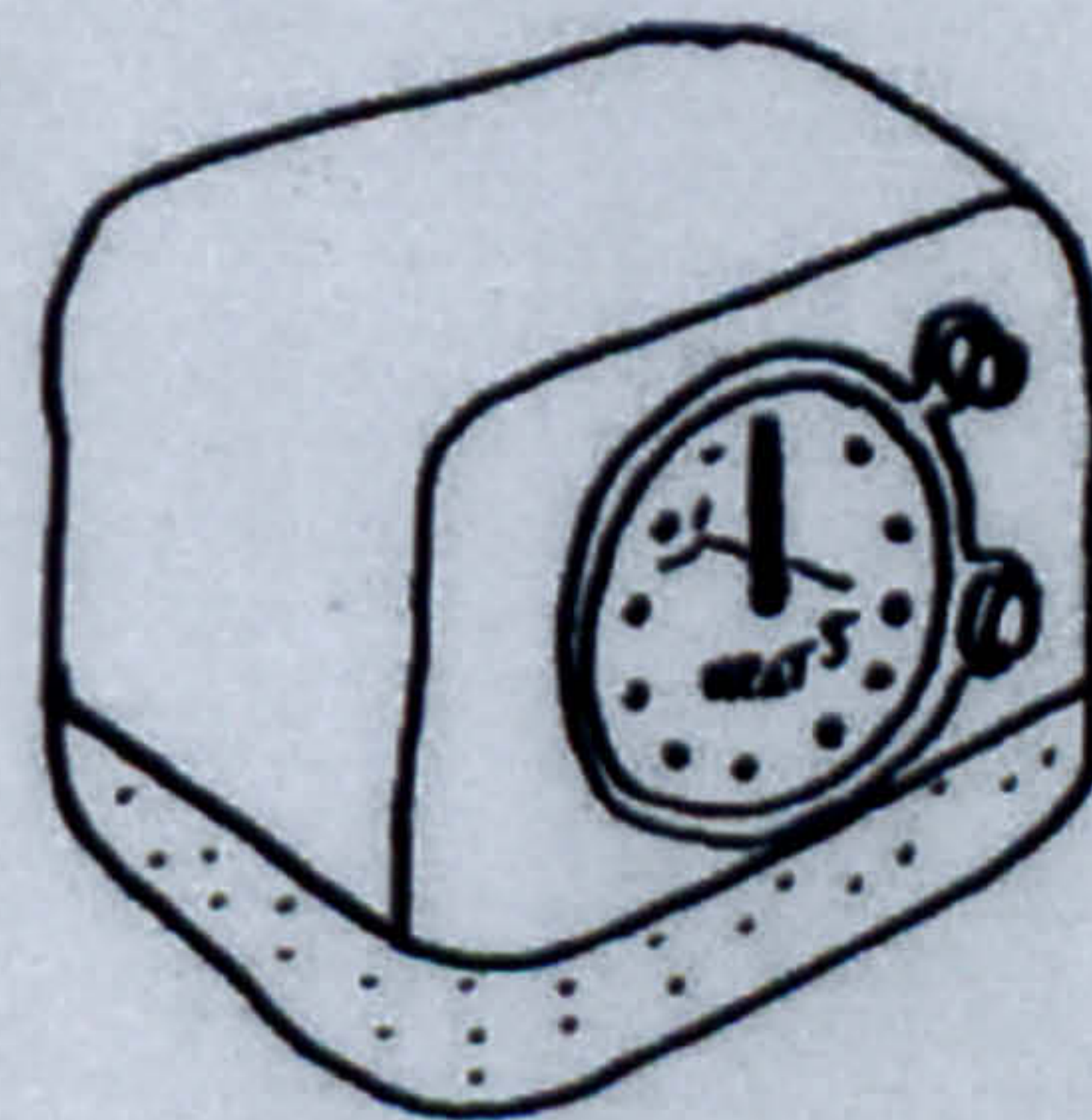
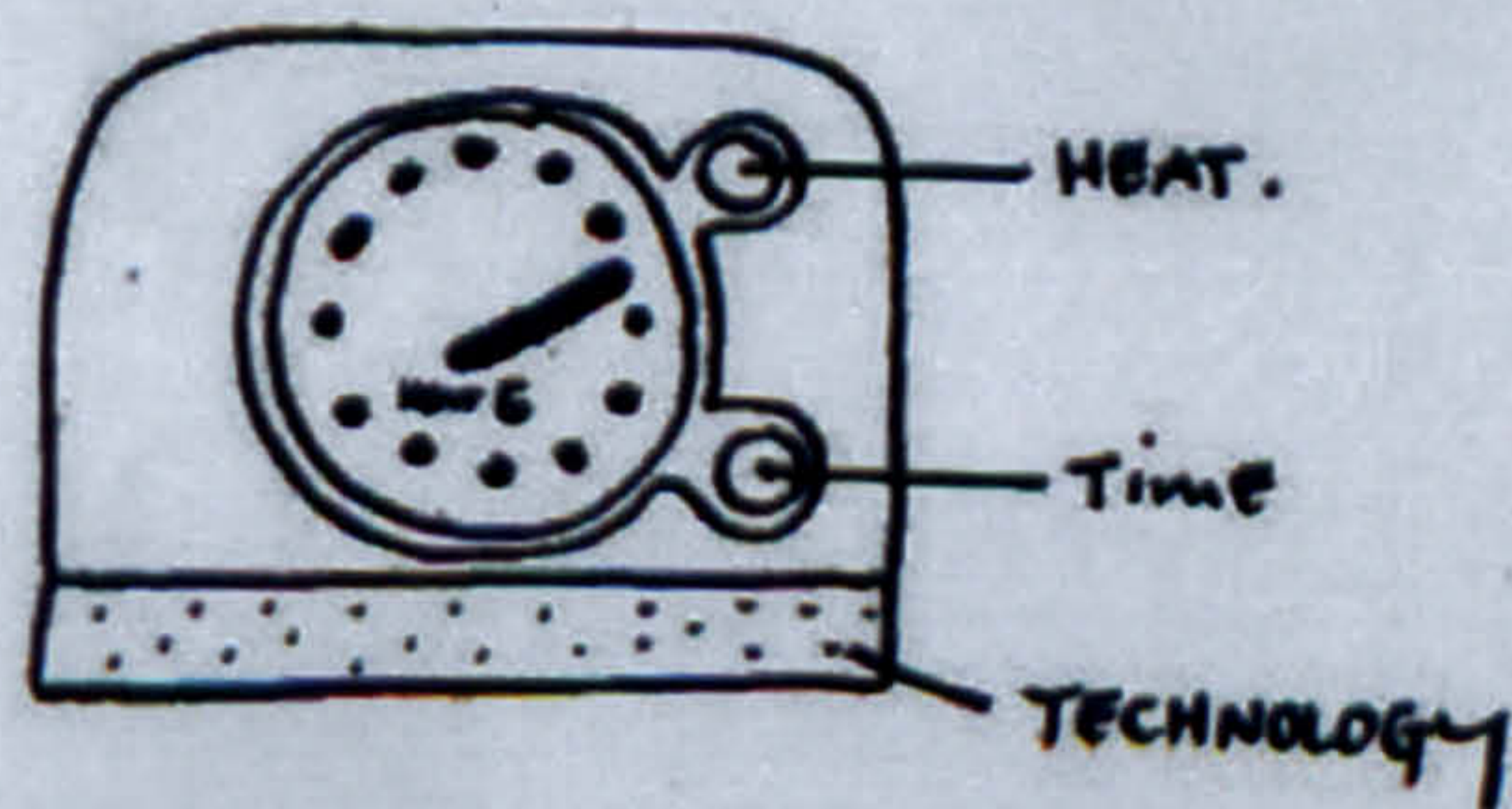
my 1st appliance > MWO. K

**needs**

user interface not only needs to work simpler but also look simpler

**opportunity**

- > 'port hole' window used transparent LCD for interface
- > only timer and heat level controls
- > when not in use, functions as extra large kitchen clock



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### my 1st appliance Refidgerator. A

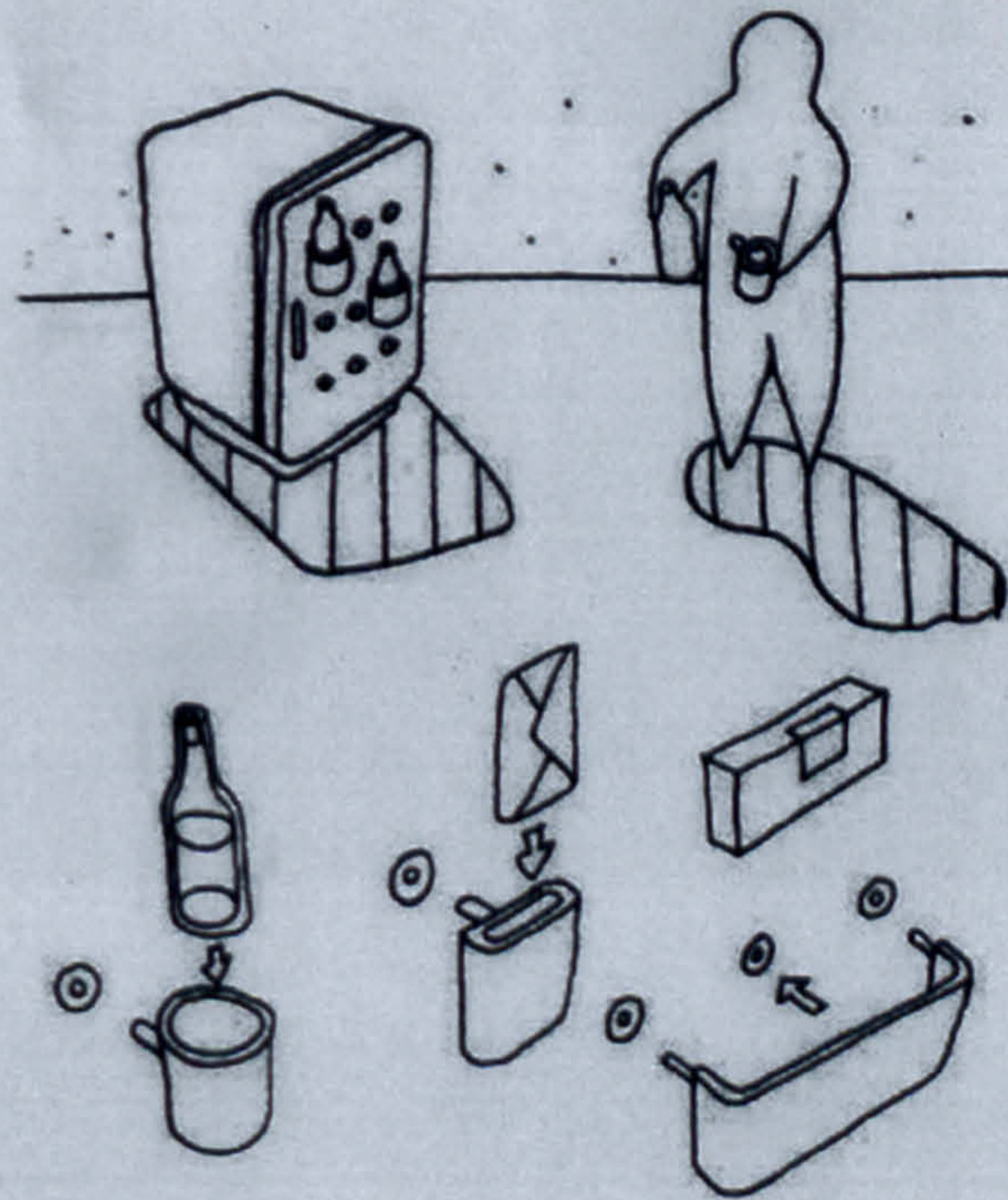
**needs**

additional storage space in the kitchen

**opportunity**

> a series of pods which plug in to the fridge door

> storing red wine; letters; papers etc....



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### my 1st appliance > Refidgerator. B

**needs**

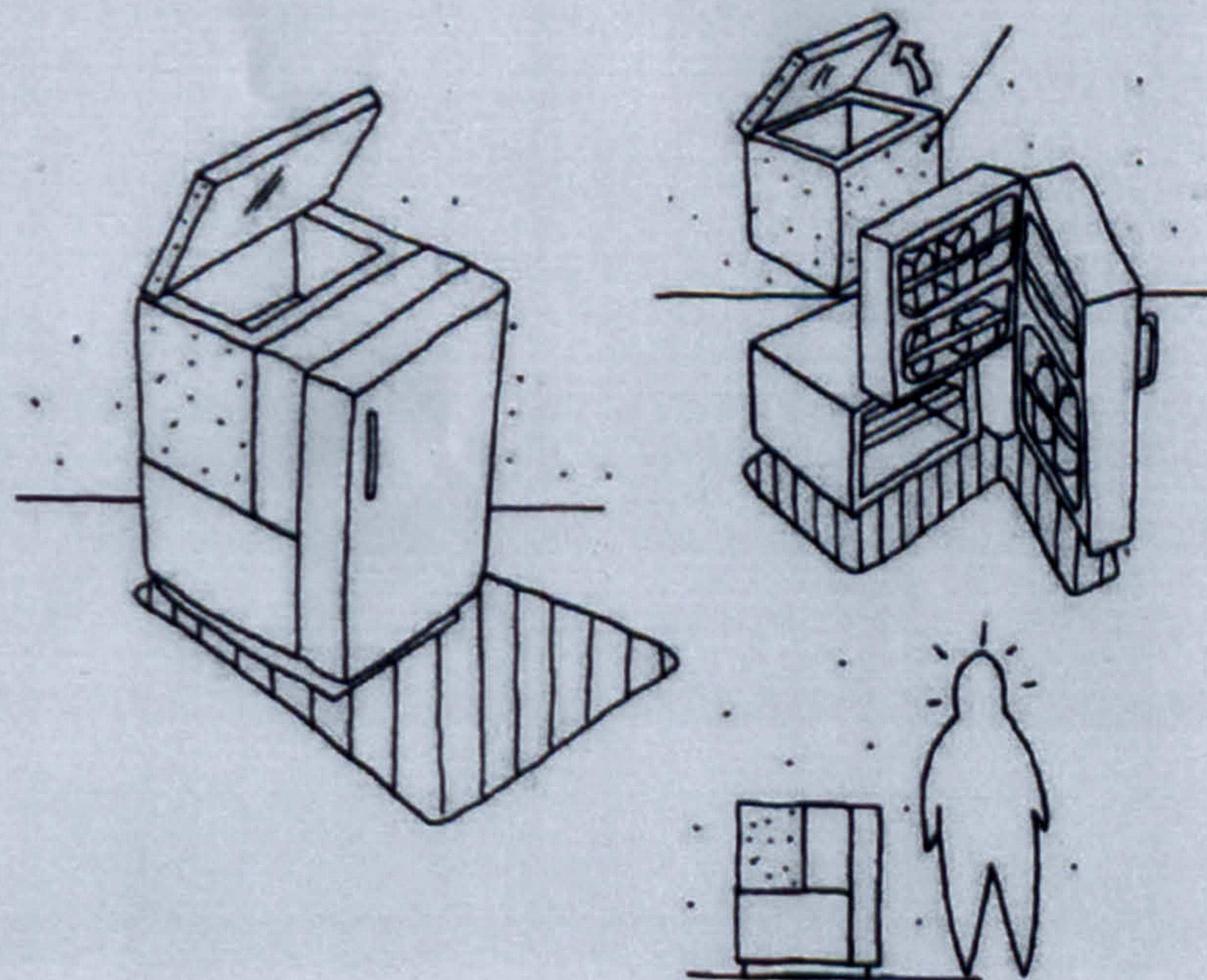
a modular product that enables the buyer to purchase a product for his her needs.

**opportunity**

> possible extra large doors

> top loading freezer compartment for better access ( can also be a microwave, when the lower pod is a freezer )

> a series of pods designed to fit user lifestyles



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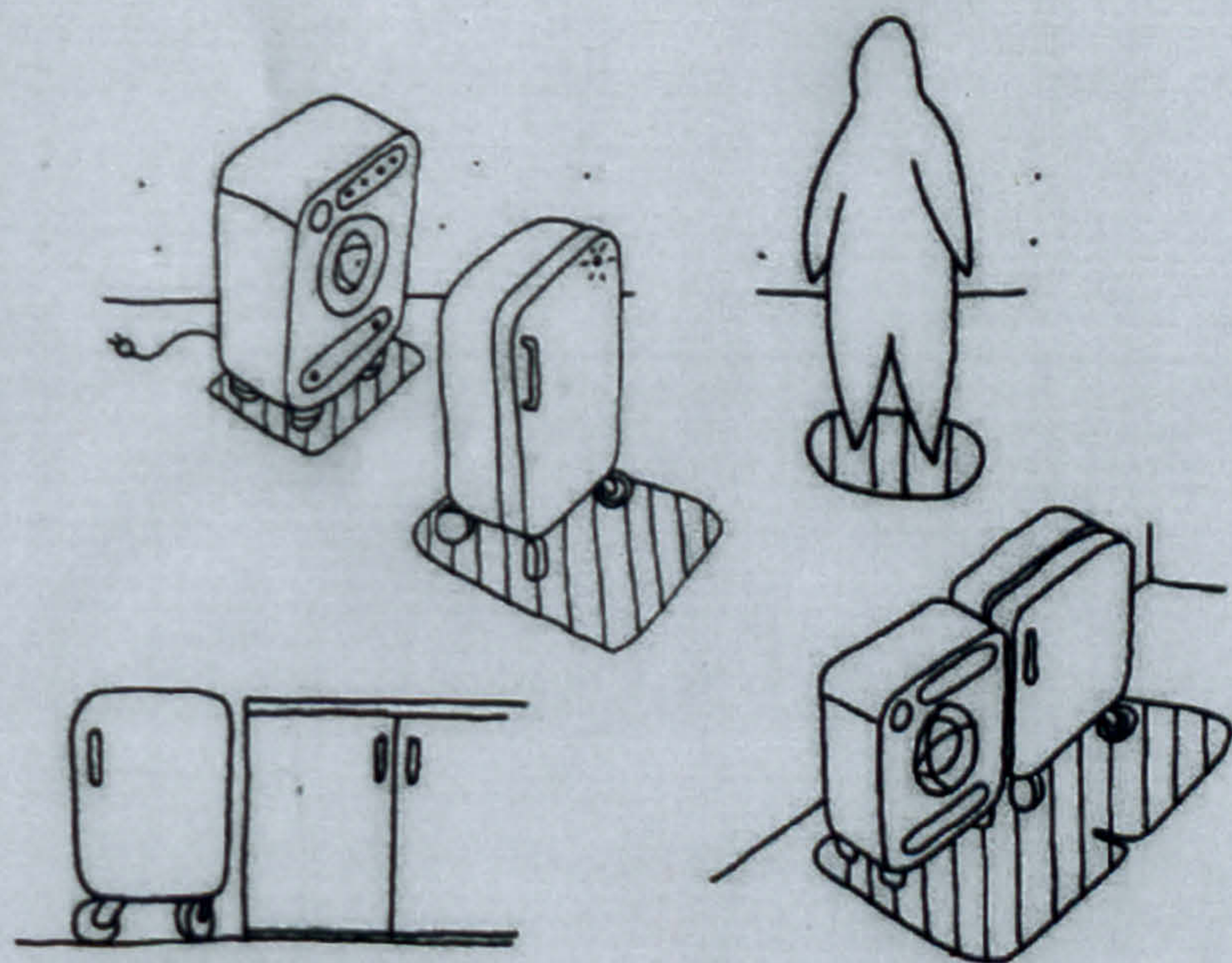
**my 1st appliance > Refidgerator. C**

**needs**

slim products for the smaller home

**opportunity**

- > a slim range of products, which fit into a standard space
- > slim fridge / freezer / washing machine
- > fridge or freezer on wheels



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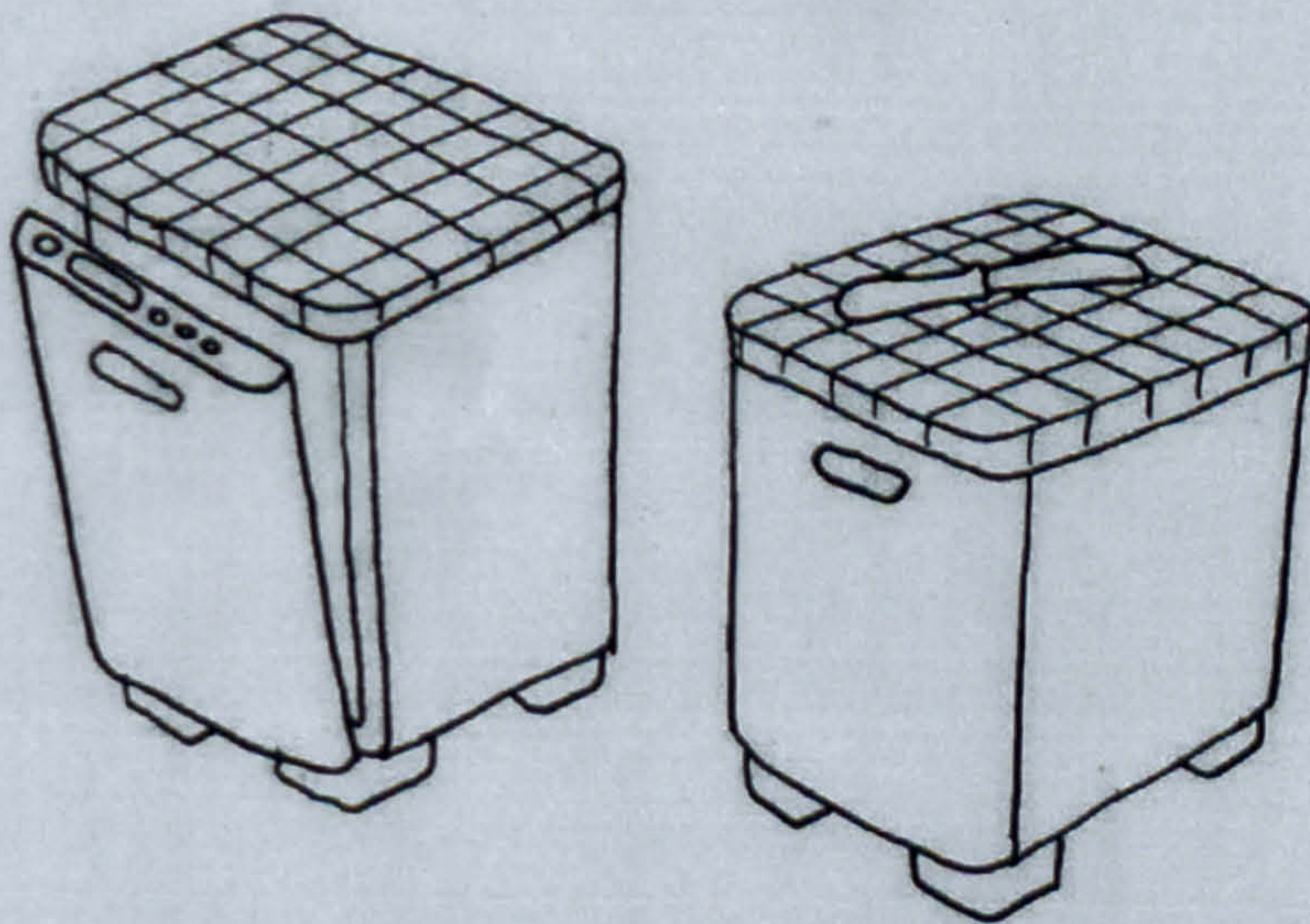
**my 1st appliance > Dishwasher. A**

**needs**

cost effective, space saving solution

**opportunity**

- > top as work surface
- > top as chopping board



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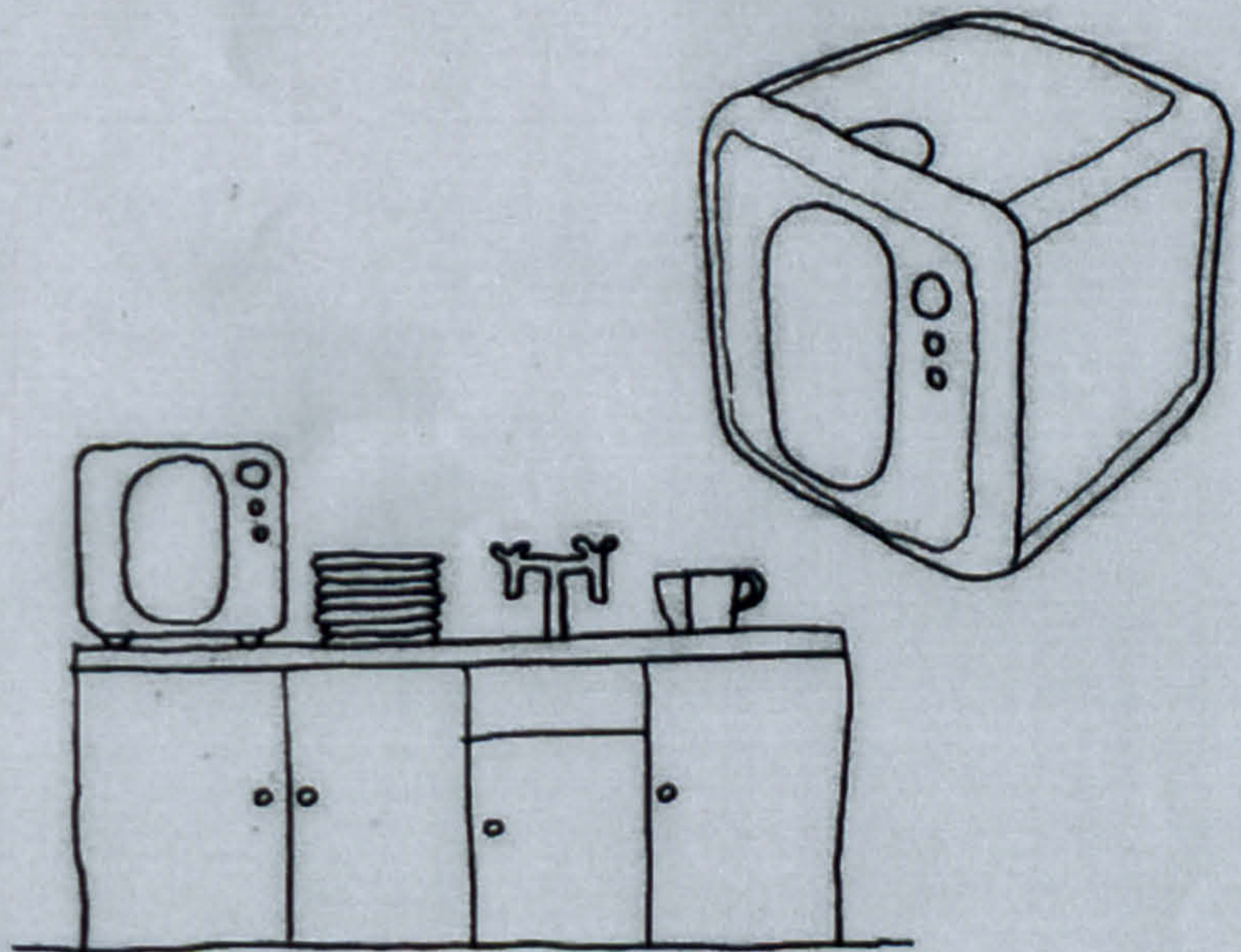
**my 1st appliance > Dishwasher. B**

**needs**

small, cost effective and space saving solution for single person, student or young couple.

**opportunity**

- > smaller appliance
- > basic features



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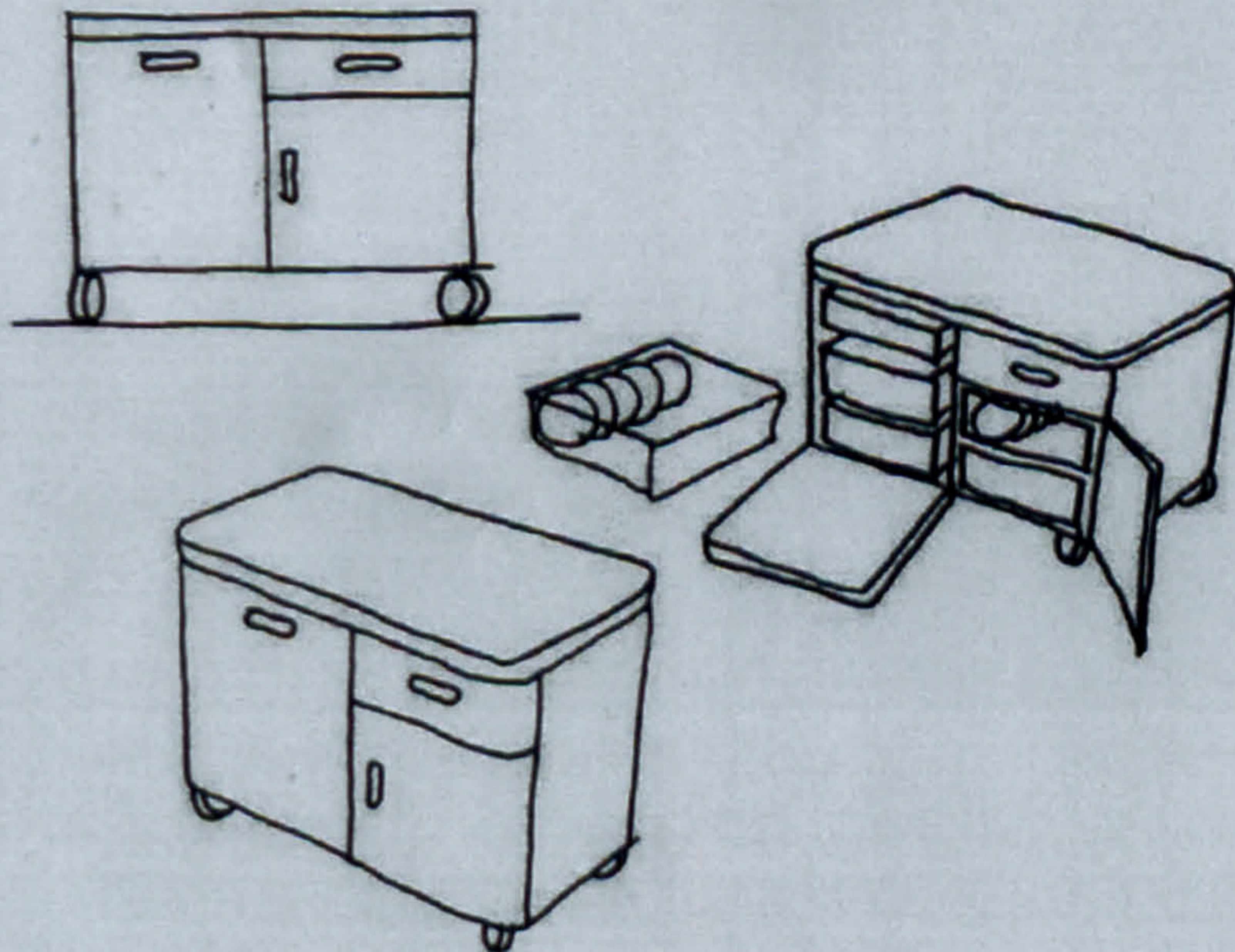
**my 1st appliance > Dishwasher. C**

**needs**

organised solution. dishwasher and storage space for tableware.

**opportunity**

- > interchangeable trays and cutlery tray.
- > trays based on standard cupboard sizes
- > integrated solution
- > work surface
- > mobile and flexible



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Appendix F: **Main Study – Aspect 3**

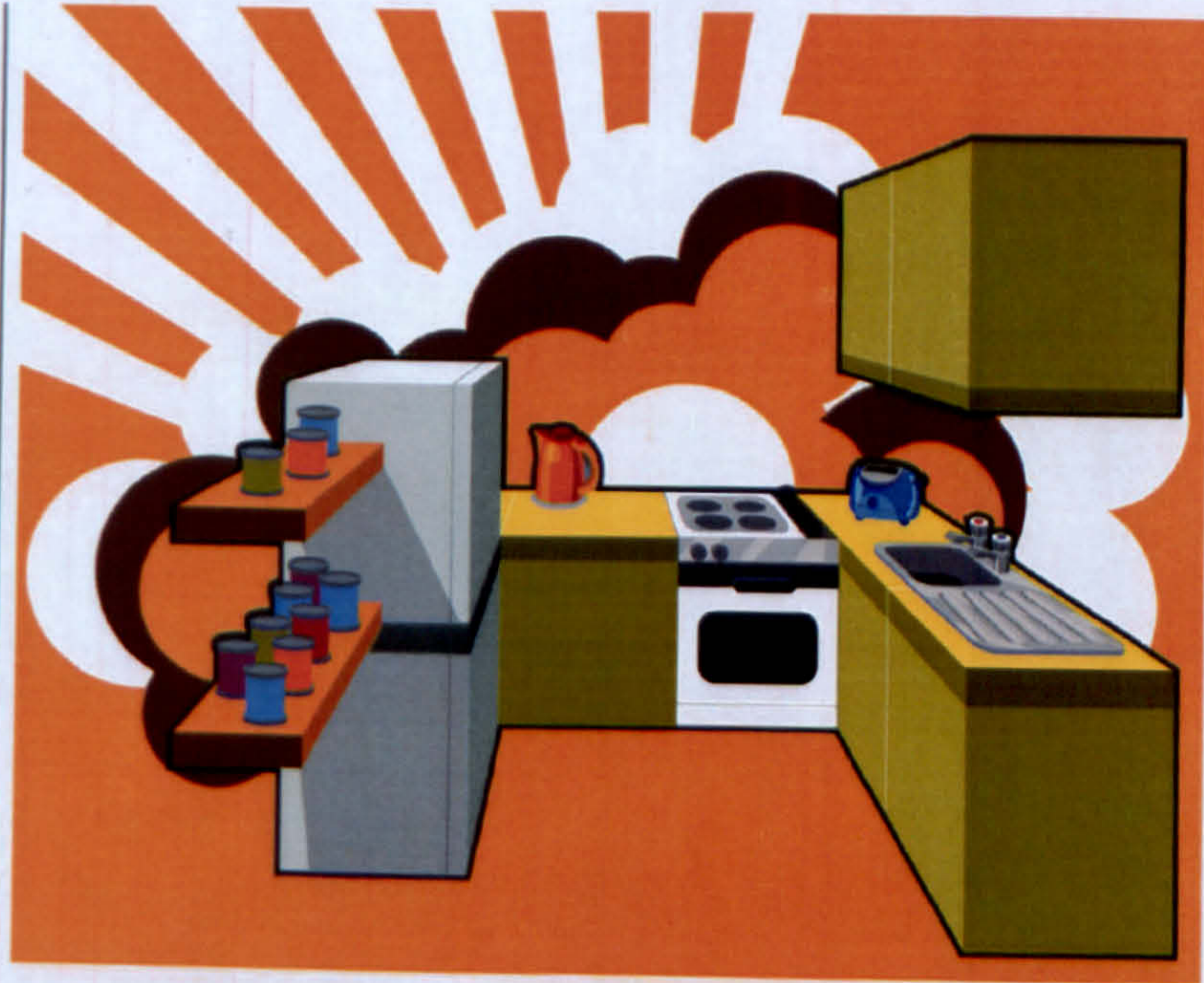
**my 1st appliance**

**Who:**  
young singles/couples, students,  
newly weds

**Where:**  
rented apartments, 1st home

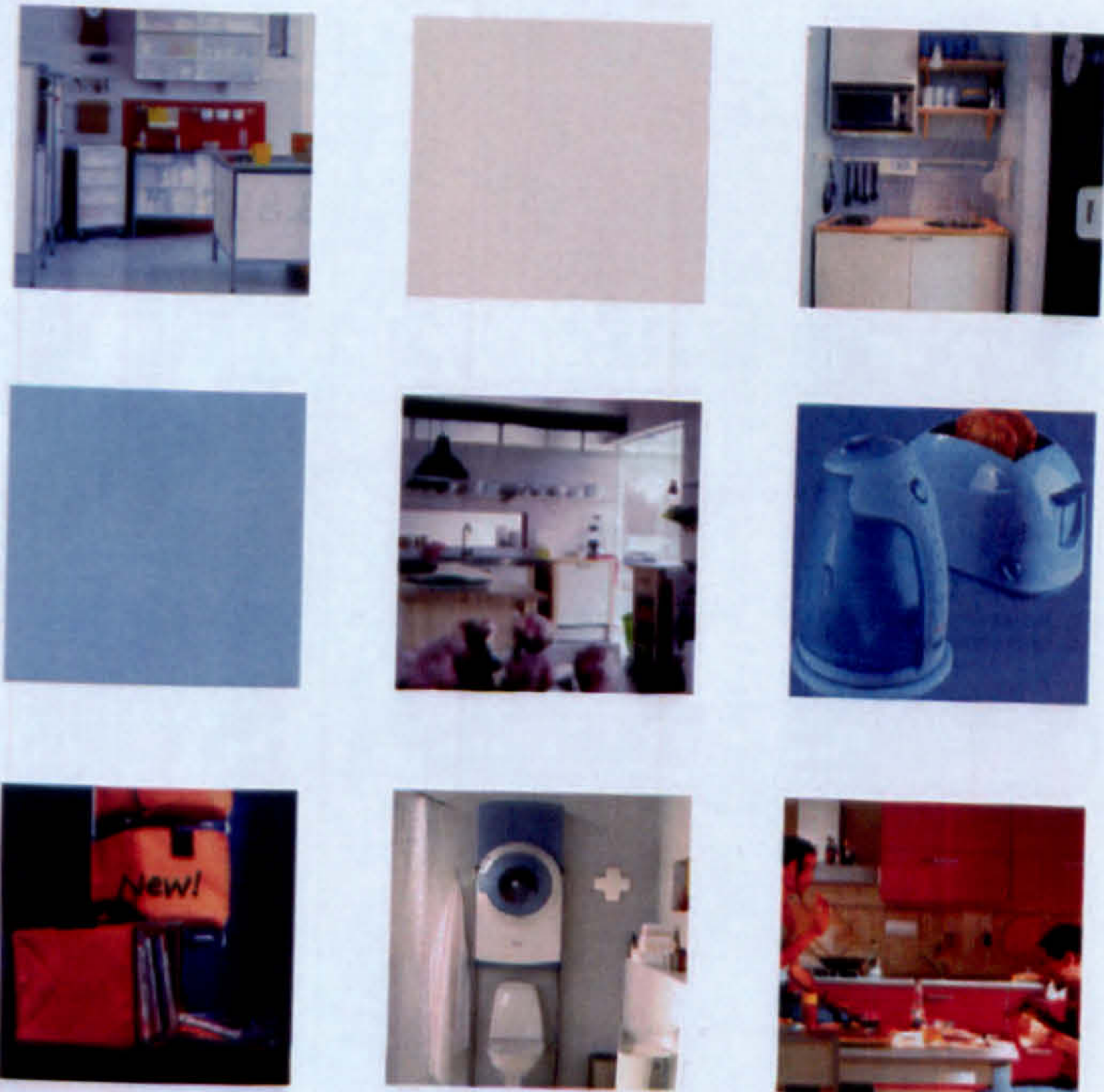
**Qualities:**

- > affordable
- > simple / bold
- > space efficient
- > multiple purchase at one time



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**my 1st appliance**



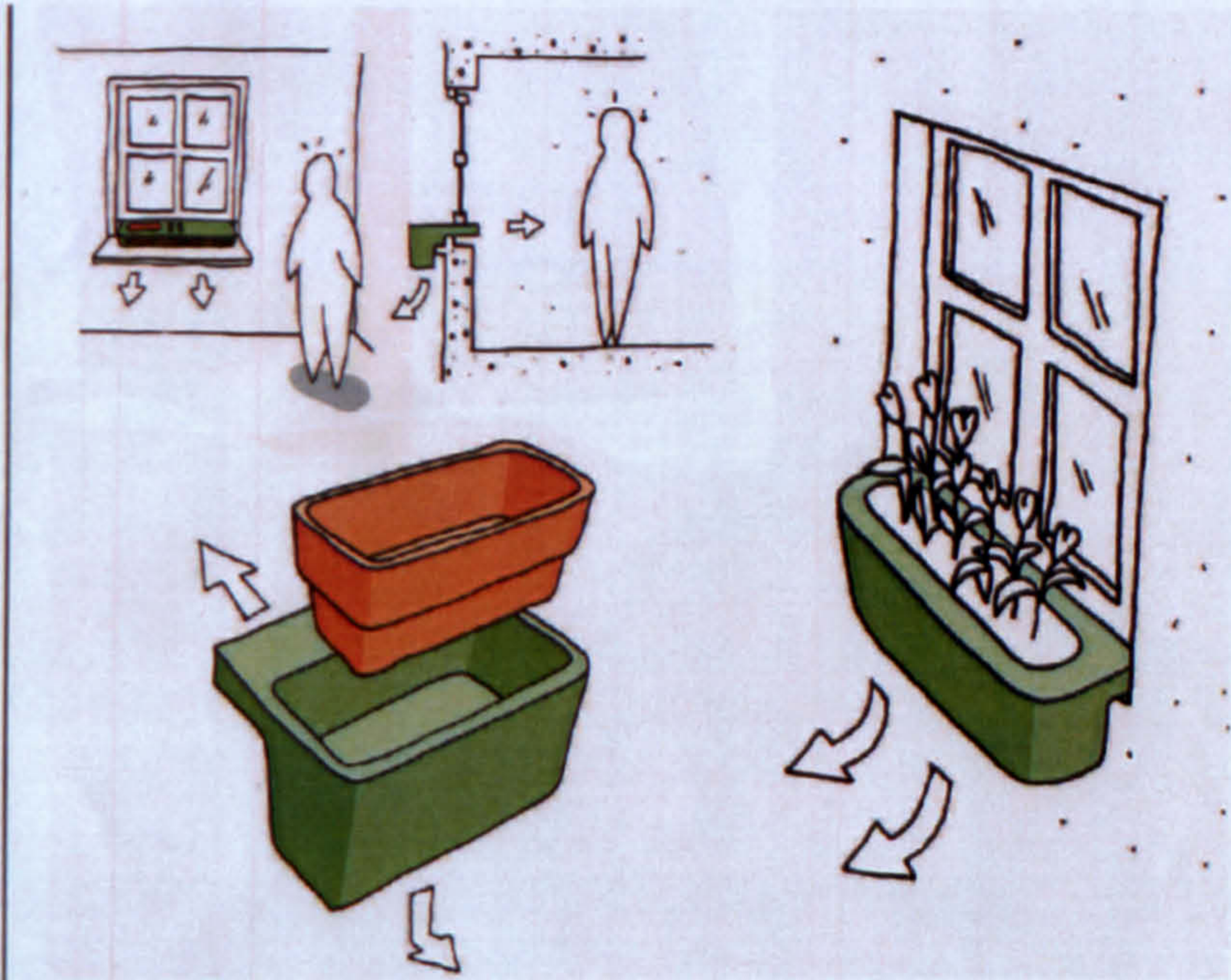
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Appendix F: **Main Study – Aspect 3**

my 1st appliance > 1.1 airconditioning

**needs**  
discrete air conditioning.

- opportunity**
- > 90% of the air conditioning unit is placed outside
  - > better sound/noise insulation
  - > slim, discrete control panel, including temperature settings located on window sill
  - > removable plant holder with drainage



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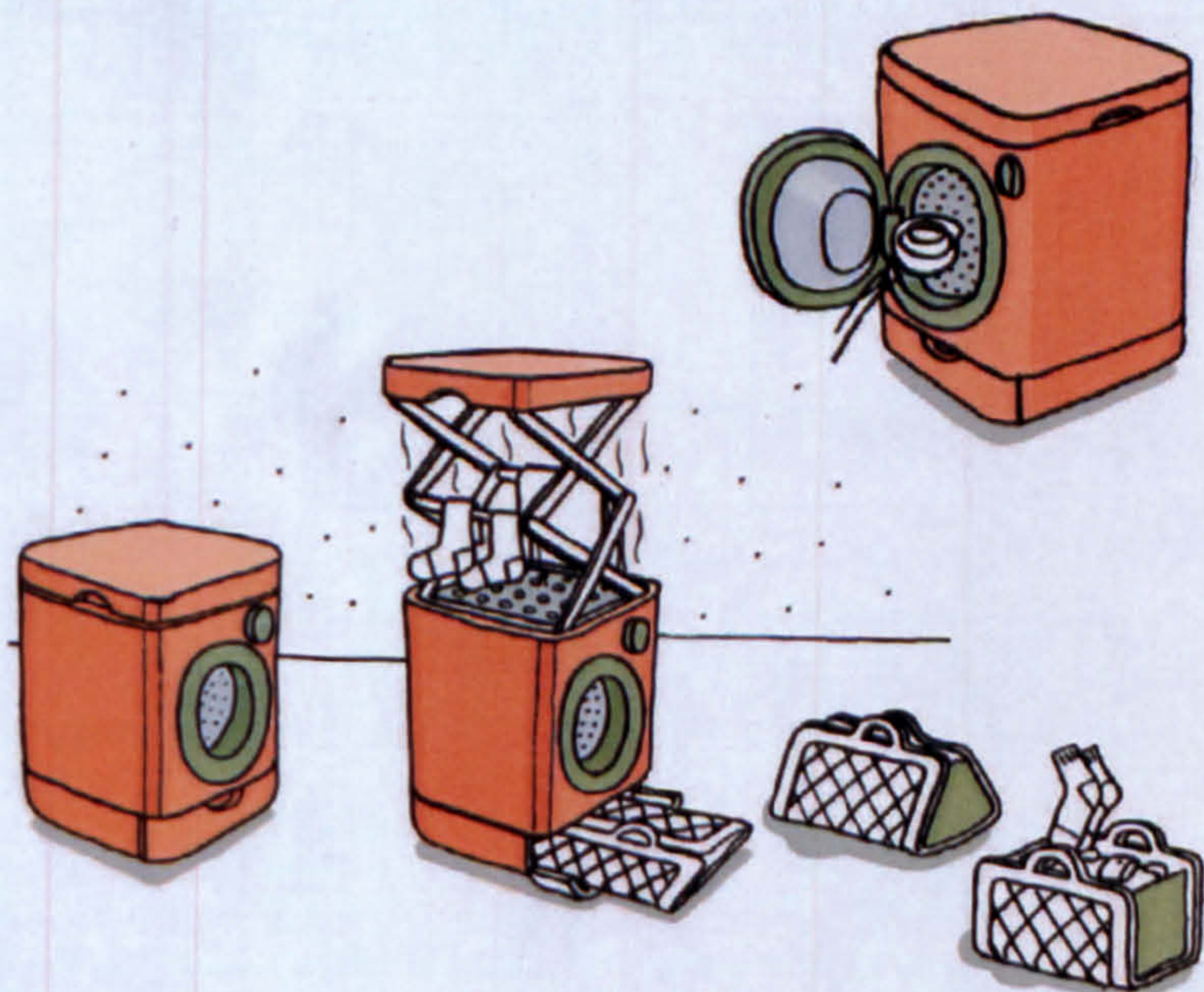
my 1st appliance > 1.2 washing machine



**research findings**  
my info ms housewife > 'we have no room for a washing machine and cloths horse'

**needs**  
a compact, complete, washing and drying solution.

- opportunity**
- > integrated top heater and clothes rack for drying
  - > collapsable wash basket stored in the bottom of the washing machine when not in use



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## Appendix F: **Main Study – Aspect 3**

### my 1st appliance > 1.2 washing machine / dishwasher



#### research findings

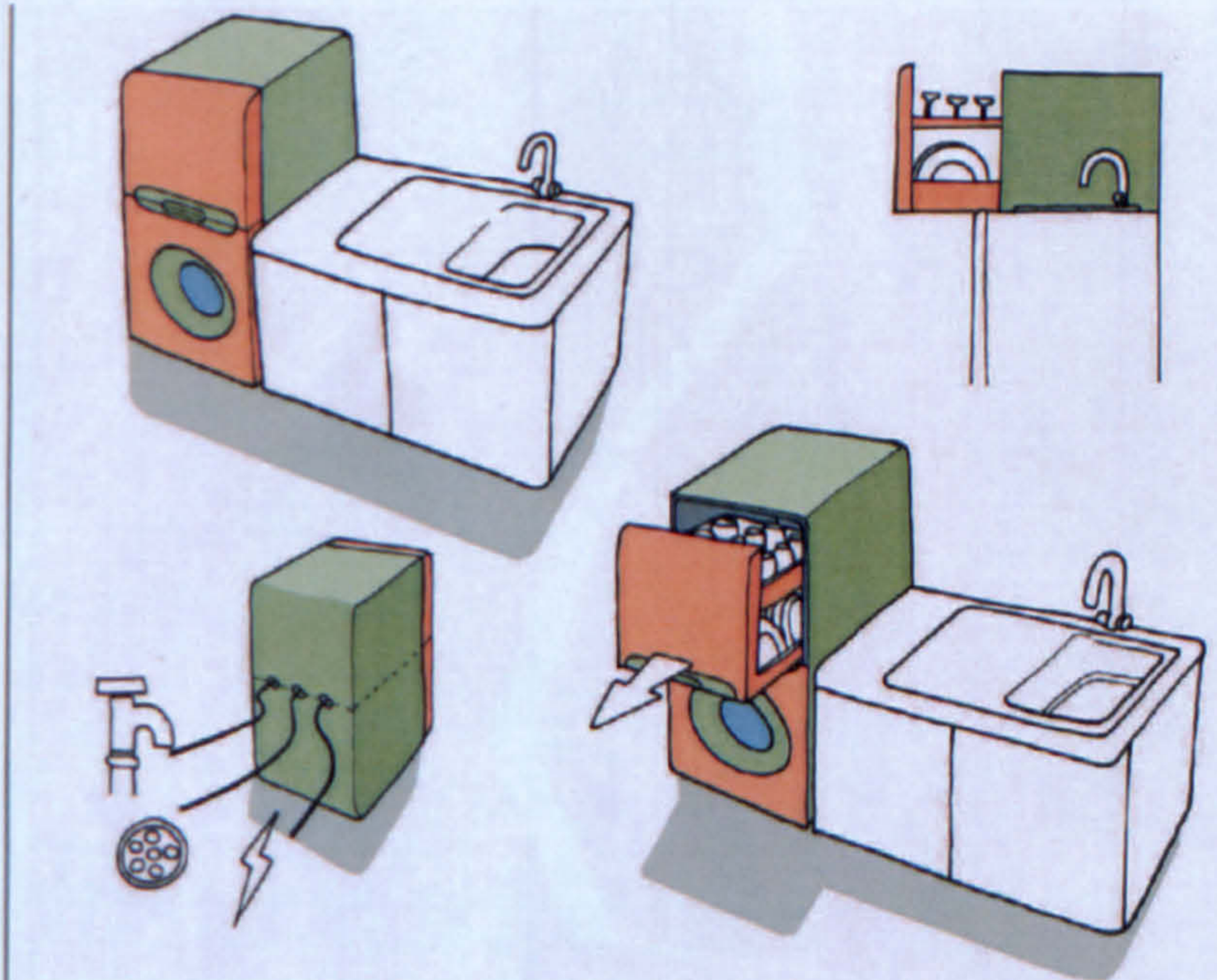
mr & miss style-conscious > "room is tight i have to stack appliances on top of each other"

#### needs

one time installation for electricity, water and drainage.

#### opportunity

- > integrated 'all in one' washing machine and dishwasher
- > sharing heating element/drainage/power
- > split UI
- > counter balanced drum



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### my 1st appliance > 1.4 microwave



#### research findings

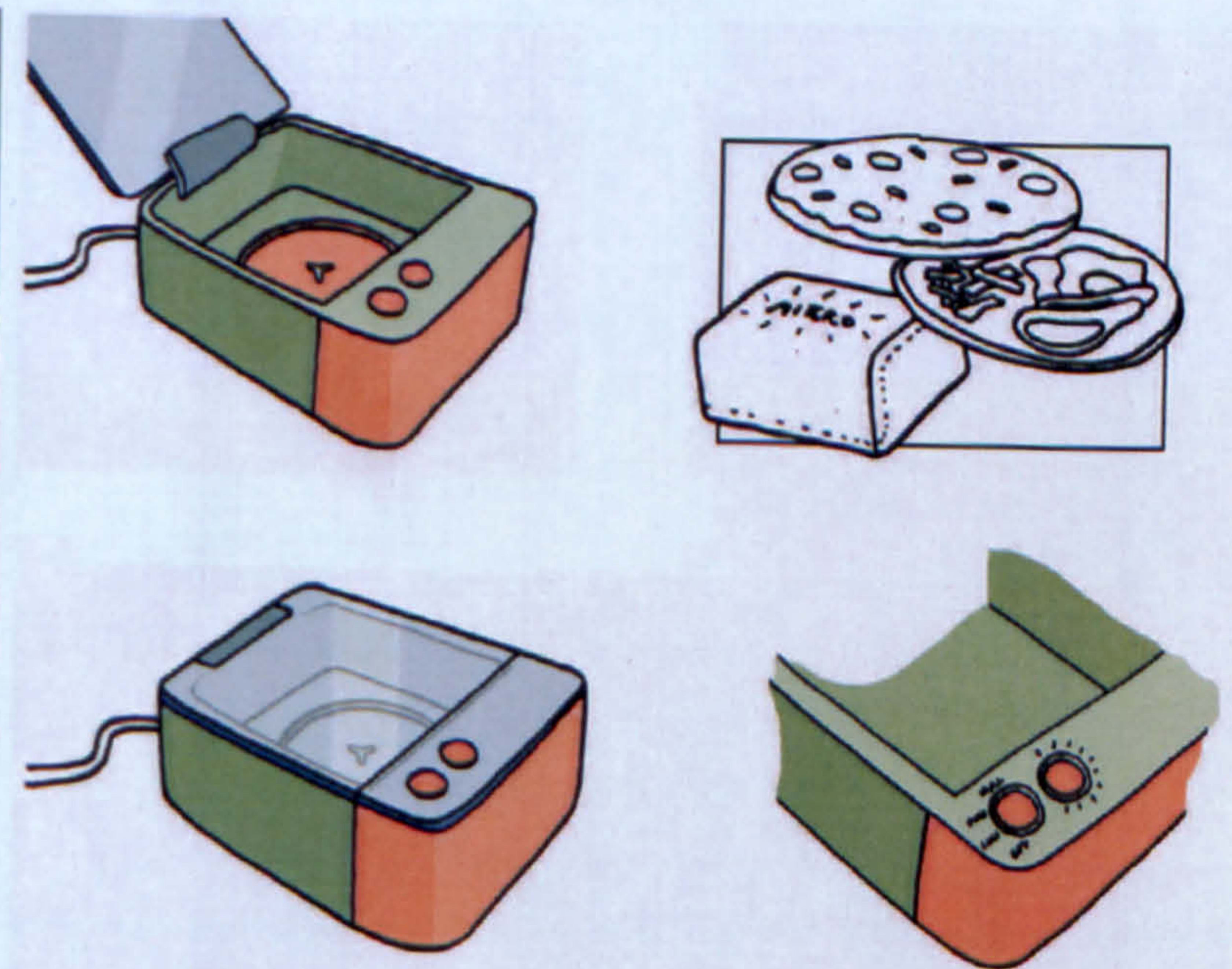
equal shavers > "we only use the micro wave in the morning for heating water, coffe and milk"

#### needs

small scale microwaving for reheating ready made meals.

#### opportunity

- > top loading, small microwave format
- > the product can be put away when not in use to save space in a small kitchen
- > possibly integrating the microwave into a drawer



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## Appendix F: Main Study – Aspect 3

### my 1st appliance > 1.5 vacuum cleaner



#### research findings

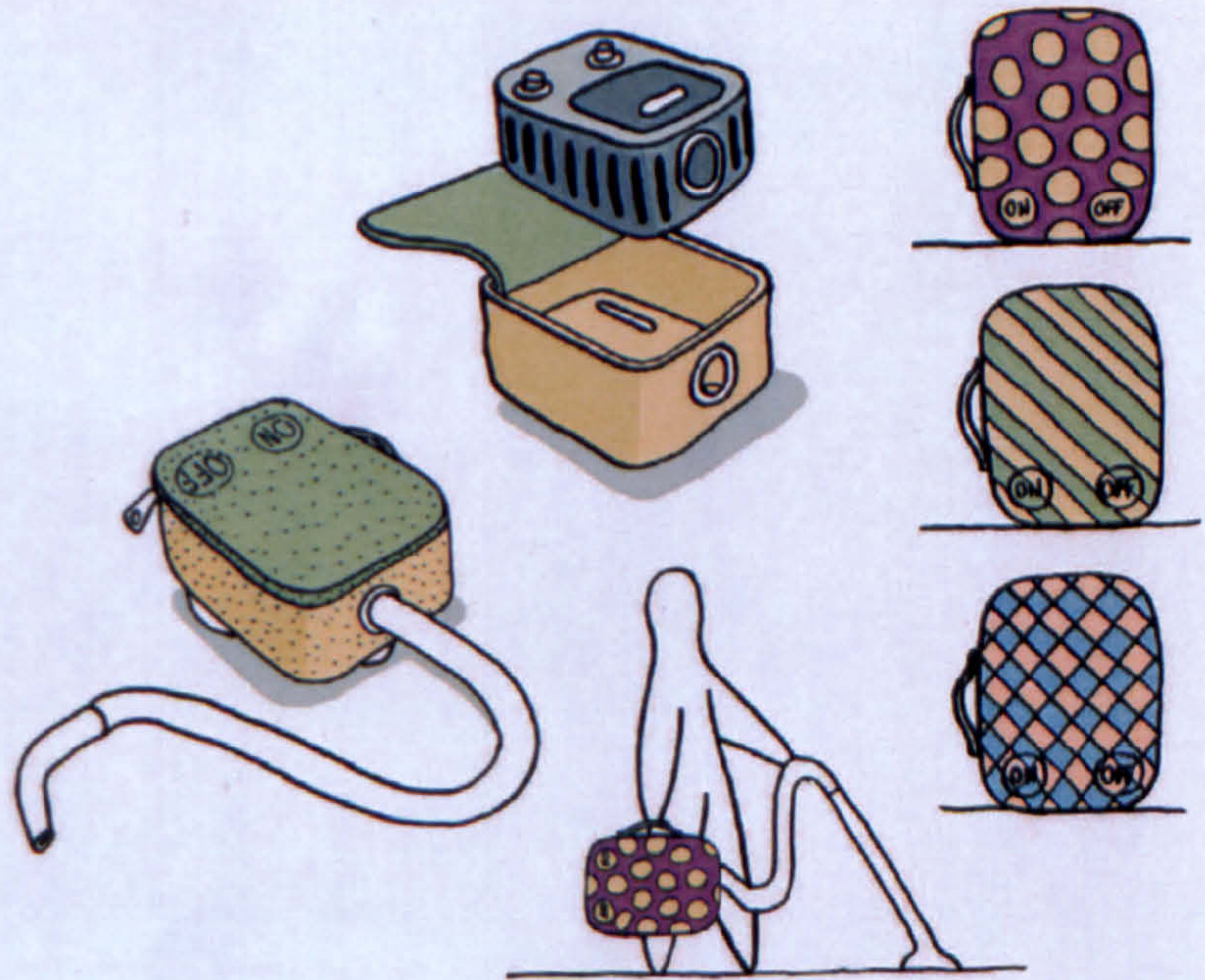
my regime & miss hygiene > "we store our vacuum cleaner in the living room, on show"

#### needs

discrete fashionable vacuum cleaner which can always be left out in the room.

#### opportunity

- > standard internal technical interior
- > external fashionable exterior with 'zip on' fabric cover
- > possibly the user can purchase additional covers to match home interior colour scheme
- > consider new fabrics and graphic prints etc.



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### apartment appliance

#### Who:

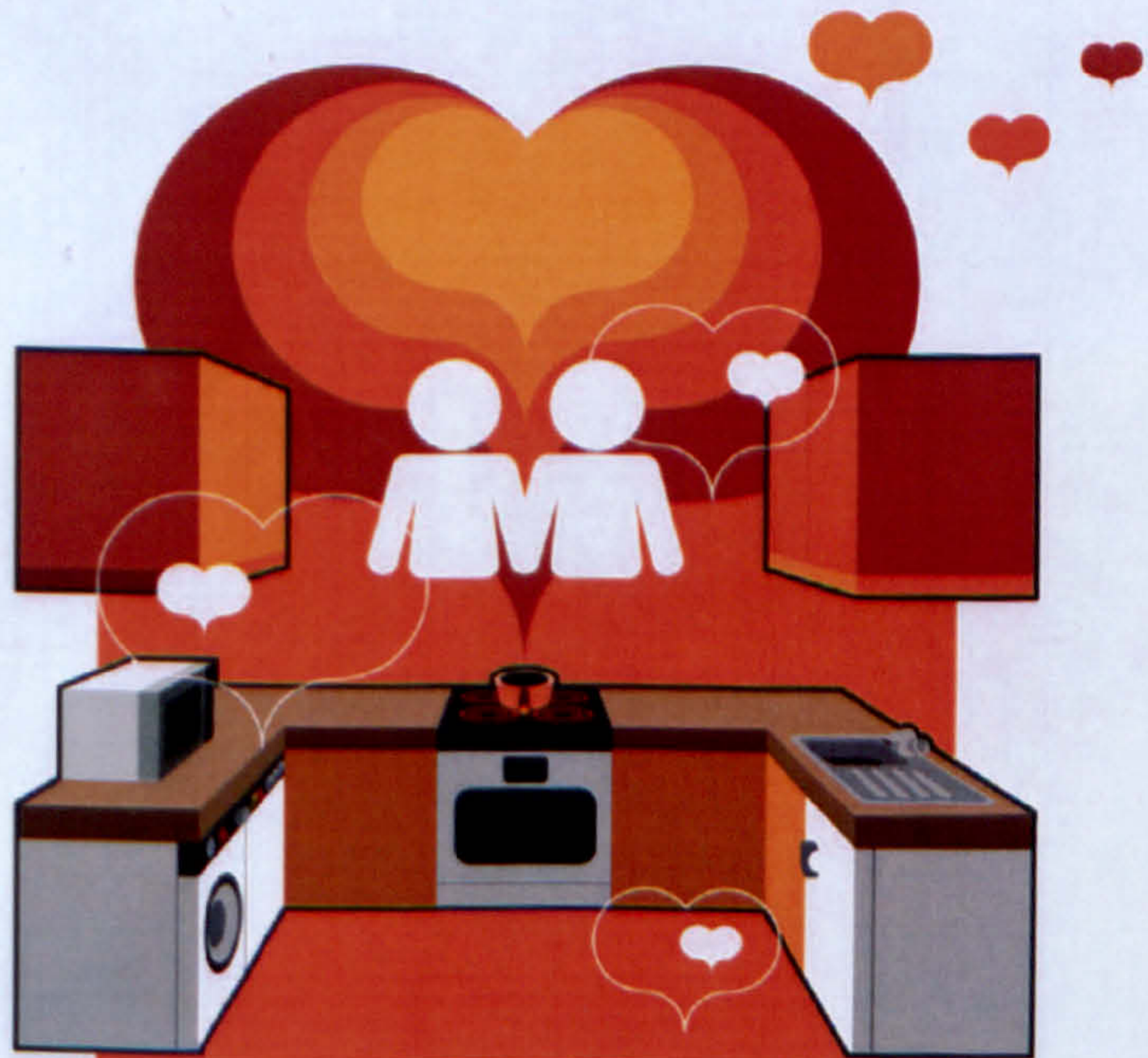
young singles/couples early to mid 20's no children

#### Where:

medium size urban apartment / limited space

#### Qualities:

- > space saving
- > combi products
- > adaptable flexible in use
- > system furniture built in feel



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## Appendix F: *Main Study – Aspect 3*

### apartment appliance > 2.1 air conditioning



#### research findings

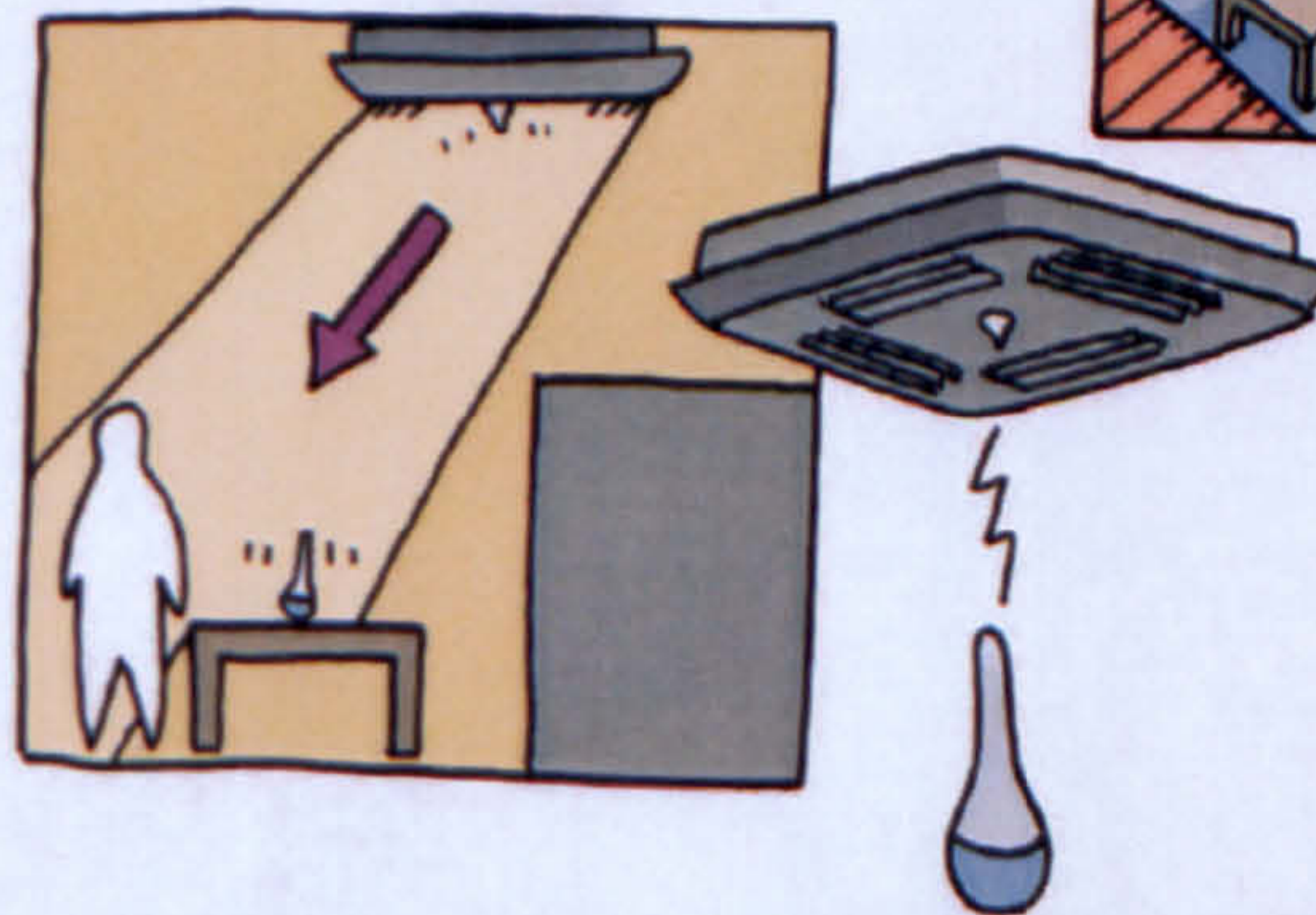
country techies > 'we move the air conditioner from room to room, and from season to season when we need it most'

#### needs

directed air conditioning

#### opportunity

- > integrated into the remote control is a radio beacon to direct the flow of air
- > cool or warm air is directed to the remote control
- > localized air quality
- > especial relevant to loft apartment living



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### apartment appliance



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Appendix F: **Main Study – Aspect 3**

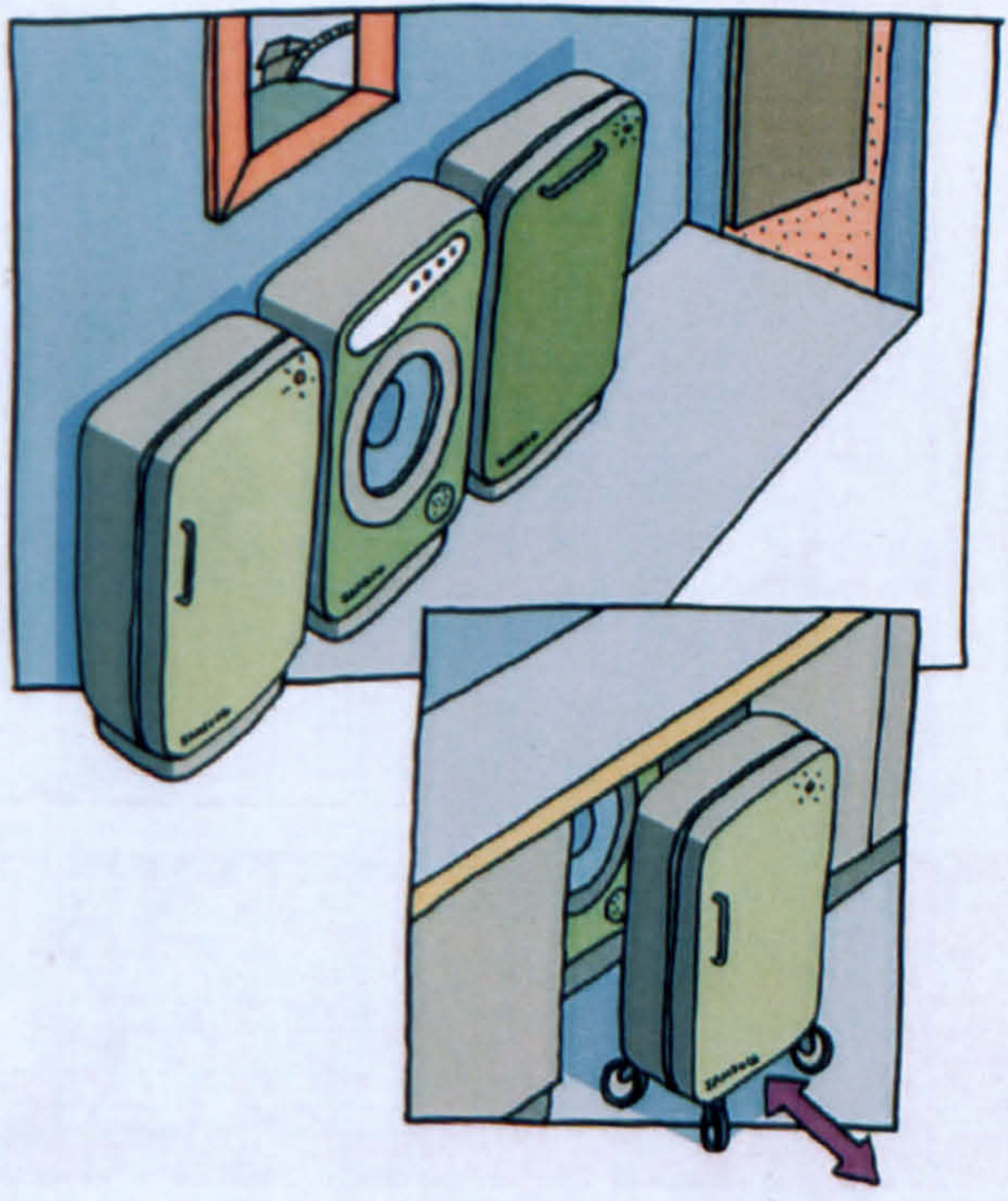
apartment appliance > 2.2 shallow range



**research findings**  
 mr & miss style-conscious > 'our kitchen is so small and all our appliances are so big'

**needs**  
 shallow products for the smaller home

- opportunity**
- > a shallow range of products, which fit into difficult areas
  - > shallow refrigerator / freezer / washing machine
  - > fridge or freezer on wheels



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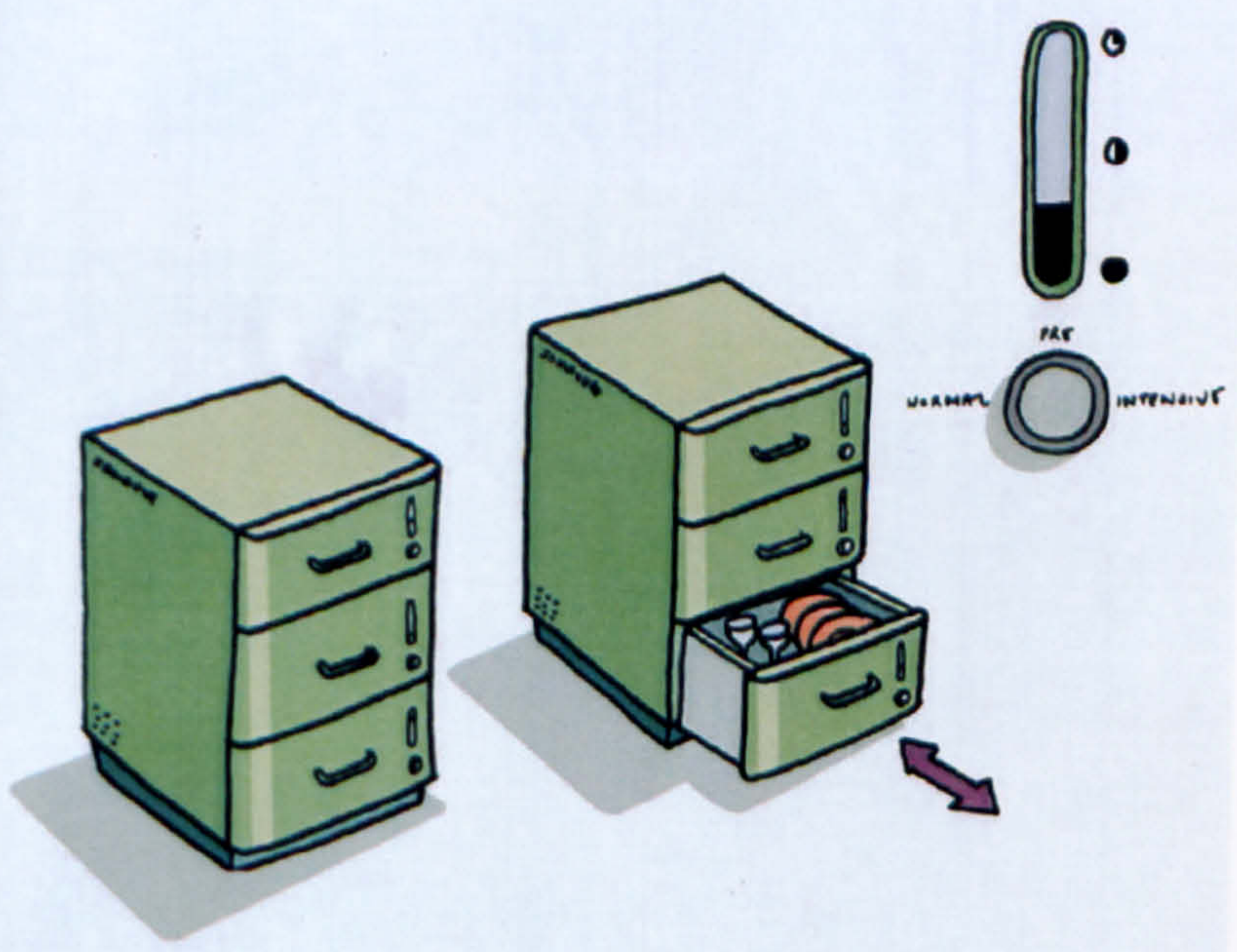
apartment appliance > 2.3 dish washer



**research findings**  
 country techies > 'we take tableware straight from the dishwasher as and when we need it'

**needs**  
 configured for my needs

- opportunity**
- > can wash 3 different areas at a time
  - > can have hard and soft washes running simultaneously
  - > the unused drawers can be used as storage while another drawers are washing



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## Appendix F: Main Study – Aspect 3

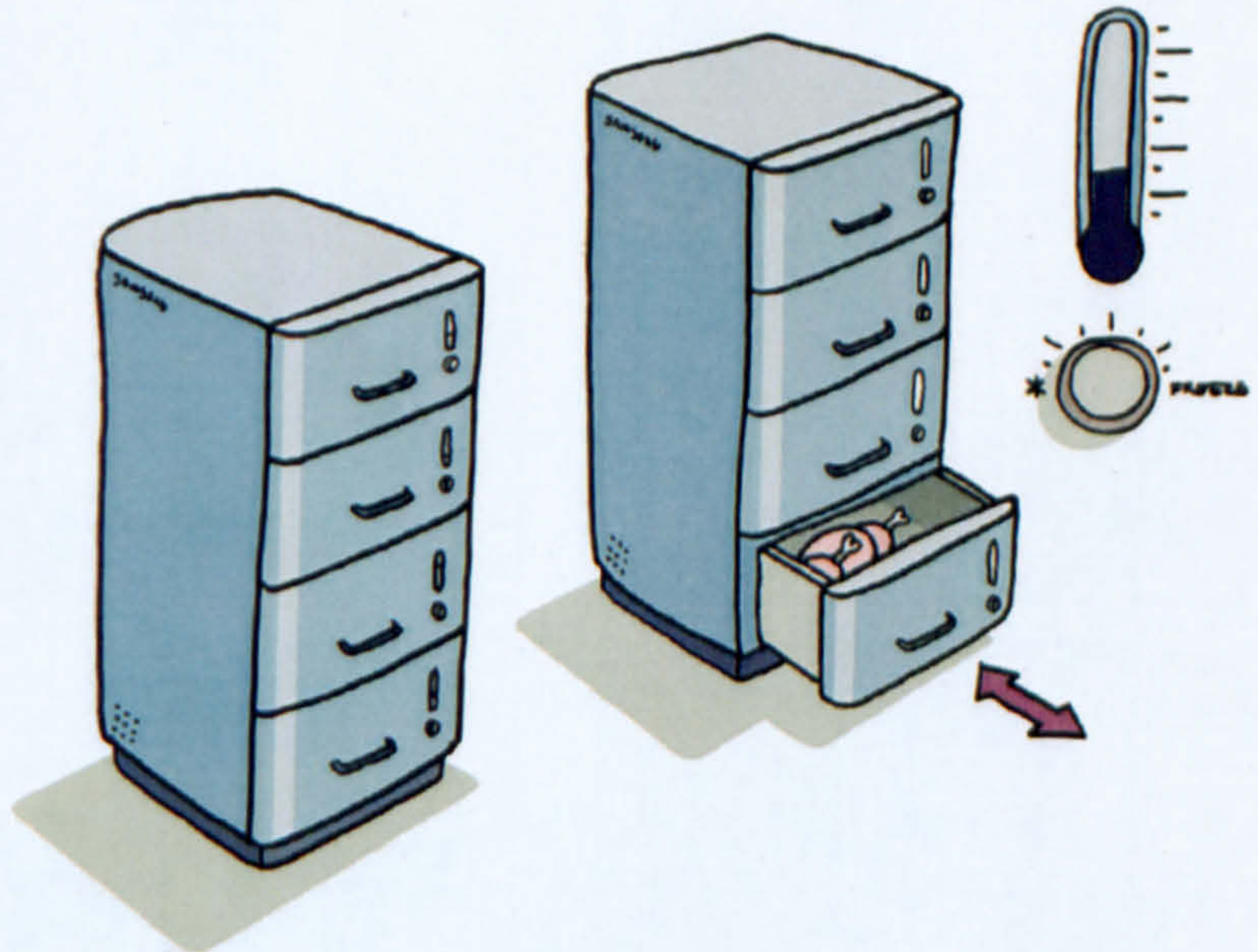
### apartment appliance > 2.4 refrigerator



**research findings**  
 multimedia singleton > 'I like big American style refrigerators but hate shopping. I shop once a month'

**needs**  
 configured for my needs

- opportunity**
- > individual temperature controlled draws
  - > expanded use for social occasions
  - > the unused drawers can be used as storage or just turned off
  - > ecological



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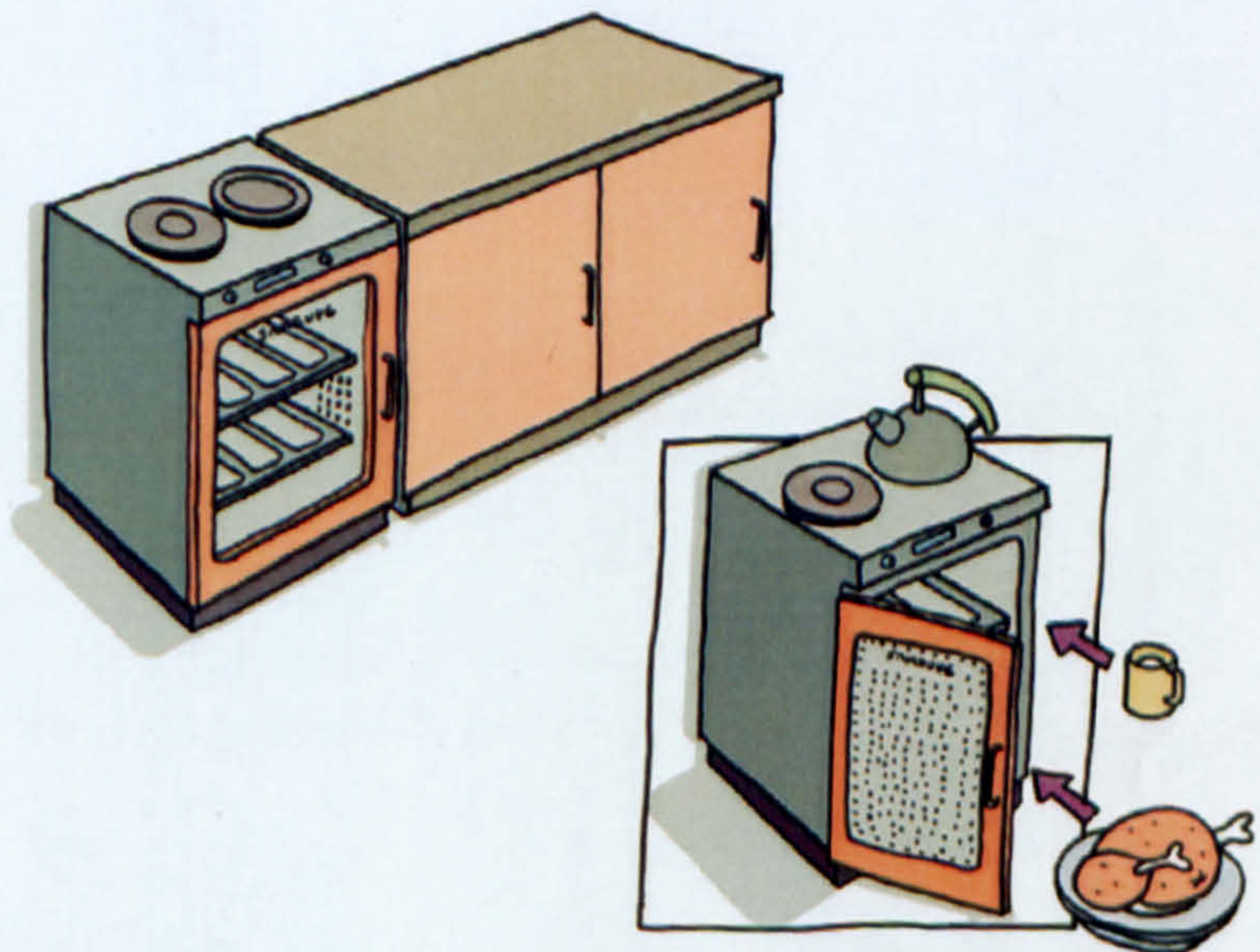
### apartment appliance > 2.5 microwave



**research findings**  
 mr & style-conscious > 'we only use the microwave to defrost food and heat up pop corn, we do not like anything 'ugly', all appliances should match or be hidden'

**needs**  
 cooking, reheating & defrosting point

- opportunity**
- > one integrated unit
  - > hidden digital cooking (change user perception)
  - > configuration to your use, microwave, fans assisted grill oven and twin hob top
  - > space saving
  - > assist in speed of cooking



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