

***Emotion and Function:
Rethinking Display and Shelving***

The thesis is submitted to the
Auckland University of Technology
in partial fulfilment of the degree of
Master of Arts (Art and Design)

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Attestation of Authorship

"I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the qualification of any degree or diploma of a university or any other institution of higher learning, except where due acknowledgement is made in the acknowledgements"

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2006

Ethics Approval

This project has obtained ethics approval (01/189) from the **Auckland University of Technology Ethics Committee** on 18th October 2005.

Kong Pei Leong

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Abstract

A product can embrace emotional qualities as well as functional qualities. Emotional qualities include fun, beauty, delight, surprise and any pleasure of the senses, such as sight, touch, smell, hearing and taste. In the literature of the past decade considerable emphasis has been placed on the less tangible emotional attributes a product conveys. Designing to satisfy human emotion has become one of the main design considerations for today's society. A product should not be designed to satisfy only the functional needs of the users but must also satisfy their psychological and emotional needs.

This project is focused on exploring empathic design to develop an emotional display system to fulfill users' desires, aspirations and provide pleasurable experiences. Empathic design is an experience and emotion driven design that aims to enrich users' lifestyles, pride and pleasure, and adds value to the product. Five prototypes were evaluated through a questionnaire survey, focus groups and interviews regarding their emotional and functional qualities. While the resultant findings were not entirely conclusive, the evaluations have clearly indicated that the emotional qualities of a product are of significance to the users. Emotional qualities add pleasure and value to a product.

Using these findings as design criteria, the designer proposes a series of new conceptual designs that are more empathic to the users' emotional needs.

Chapter 1

Introduction

In the tradition of modernism, good product design is judged on technological prowess and function. *Form follows function*¹, an adage closely associated with the concept of *fitness for purpose* (Woodham, 2004), has been the philosophical design approach adopted by many functionalist product designers and architects in Germany, Britain and the United States since the early twentieth century (Howarth, 1990). The functionalists were more concerned with designing to serve a purpose and they embraced the *machine aesthetic* that used new materials and technologies, and the exploration of abstract form. Today, the innovative use of technology and reliable functionality of a product are still very important design criteria.

Research studies (Jordan, 2000; Green, 2002; Coates, 2002; Norman, 2004; Cagan and Vogel, 2001) have indicated that a product should not only be designed to satisfy the *functional* needs of the user. Instead a product must satisfy the users' *psychological* and *emotional* needs (Bloch, 1995; Norman, 2004). During the past ten years or so considerable emphasis has been placed on the less tangible emotional attributes that a product conveys (McDonagh et al., 2003). Designing to satisfy human emotion has become a very important design consideration for today's society, a process call *empathic design*² (Crozier, 1994; Coates 2002). Empathic design is an emotionally driven design that aims to enrich users' lifestyles, pride and pleasure,³ and adds value to the product.

This project's aim is to rethink and reposition the display shelf as a foreground object by focusing on exploring empathic design to develop an emotional display system to fulfill users' desires and aspirations and to provide pleasurable experiences. The relevant display system is the open shelving that people use for displaying or organising their memorable or special items. Display systems are an important part of the domestic habitat (Sembach, 1997). Like other items of furniture display shelves are an expression of lifestyle and style of consumption. Five prototypes of display shelving were designed as a vehicle for identifying consumers' wants and desires, rather than their needs through a questionnaire survey, focus groups and interviews. Buying for need is driven by price and convenience but experience concerns desires (Gobe, 2005).

¹ A phrase coined by the American architect and designer Louis Sullivan in 1896 in relation to organic growth (Woodham, 2004).

² *Empathy*: a term coined by Robert Vischer, the German philosopher, in 1873. *Empathic* literally means the emotional bond a person forms or the feeling a person has for nonliving artifacts, while in the context of product design *empathic design* is the expression, posture and gesture arising from a product's shape, colour, texture and all other aspects of its visible form. These shape what and how we feel about it (Coates, 2002).

³ In the context of product design *pleasure* can be defined as the *emotional*, *hedonic* (sensory and aesthetic pleasure) and *practical* benefits associated with products and services (Jordan, 2002).

In the study, a series of display systems is designed to meet the desires of new consumers⁴ (Lewis, 2001). New consumers see consumption as art and play (Pantzar, 2000). They don't just buy a product; they buy value in the form of entertainment, experience and self identity (Esslinger, H, in Sweet, 1999). Today, more and more sensual consumers⁵ (Underhill, 2000) make their purchase decisions based on trial and touch as they imagine the context of product use; they buy things that give pleasurable experiences such as fun, beauty, coolness, amusement and pride. This design project presents consumers with a new sensory experience.

This study is an attempt to transform an ordinary shelf into an artistic, *functional sculpture*. The objective is to infuse the shelf with aesthetic qualities (emotional value) to capture a user's attention, and provide pleasure and aesthetic experience. This represents an important shift in design research and product innovation. It is a shift from pragmatic to aesthetic design, integrating beauty into the product to delight the consumers' senses, enriching their positive aesthetic experiences and pleasures to make these the most important components in their buying decision (Yap, 2001). Therefore this project focuses on the importance of capturing consumer emotions beyond the traditional design emphasis on functionality and materiality. Form follows function is no longer enough; form follows emotion is now the current buzz phrase for product innovation. However the study demonstrates that a good product must have beautiful form and superior functions, so that *form and function must fulfil fantasy* (Cagan and Vogel, 2001).

This study adds to the body of knowledge arising from research-based evidence about the process of emotional design development, manufacturing and the impact of financial considerations in the creation of a display system. The information gathering techniques used are questionnaires, focus groups and interviews with design professionals. The data is used to verify ideal emotional aspects of a display system that may play a significant role in determining consumer aesthetic experiences and purchase choices.

1.1 Research Aim

This design research project is concerned with how ordinary and mundane shelving can receive value-added qualities through the application of emotional styling. The wish is to attract the consumer's attention and evoke positive aesthetic impressions (Palmer, 1996; Csikszentmihalyi, 1991). The project explores the notion of aesthetic values (empathic characteristics) in display shelving design, rather than its functional qualities, within the context of aesthetic consumption (Postrel, 2004) through the consumers' senses, especially their visual and tactile senses. The

⁴ New consumers are individualistic, involved, independent minded and well informed on consumer matters. Their attitudes toward consumption are far more concerned with satisfying their wants, which focus on original, innovative and distinctive products and services. They reject mass-produced commodities in favour of products and services that are authentic (Lewis, 2001).

⁵ Sensual consumers are the shoppers who indulge in seeing, touching, smelling or tasting something to ensure it promises pleasure before buying it. They use their senses as the basis for choosing or rejecting a product. This sensory aspect of the shopping experience is the key decision-making process in consumption (Underhill, 1999).

study demonstrates how a new and novel design can contribute to the delight of a consumer through the emotional and sensory design of a display system.

Thesis Overview

Chapter One consists of an introduction, an outline of the research aim and research questions for the study.

Chapter Two reviews literature relating to the field and background of the study, literature to do with such topics as display shelving, emotional design, person-shelf relationship, product aesthetics and aesthetic responses. The chapter also includes a description of potential consumers, sources of inspiration, and design influences.

Chapter Three discusses the methods used in the analysis, design and evaluation of the project.

Chapter Four discusses conceptual design development. It covers design criteria, design exploration and the prototyping process.

Chapter Five summarises the findings and evaluation data of the questionnaire survey, focus groups and interviews to inform the final design decision.

Chapter Six demonstrates the application of key findings to a conceptual design and development for a series of new design proposals.

Chapter Seven contains brief concluding statements about the importance of empathic design and how designers could imbue emotion in their design.

Chapter 6

Further Conceptual Design and Development

The evaluation has provided new insights for the designer to explore a series of bolder, more colourful and more arty and sculptural shelving systems. While the original shapes of the five prototypes have been maintained, the following new concepts have been designed to convey more fun, playfulness, tactility, and to be visually more exciting, to excite the users' emotional experience. The designer has taken some risks in exploring and challenging by proposing numerous concepts that extend the boundaries for normal, functional shelving design. The following examples show the explorations, which use colour, texture, and mixtures of smooth and rough surface textures with co-ordinated transparent and solid colours to delight and evoke the emotions of users.

6.1 Design Features, Textures and Colours

SolidWorks (2005), the 3D modeling program, is used to explore various new ideas. It provides an excellent view in testing the shelving feasibilities in the aspects of conceptual design, visual aesthetics and technical detail. Spatial application and additional functions in shelving are explored using Adobe Photoshop (2003).

The design exploration has striven to achieve a playful, stylistic and unconventional look and feel through adding new design features, colours, textures, different stacking forms, other functions and spatial applications. The design intention is to provide an interesting tactile feel and playful visual appeal in order to draw the attention of potential consumers. Besides the look and feel, the added features are also designed to function as connectors to offer multiple directional stacking for wider individual choice and flexible configurations, to mimic natural forms.

Figures 1 to 6 illustrate the initial design that was prototyped with additional textures and colours, and with a variety of design features that are added to the basic form to stimulate different tactile and visual emotions.

Design A

Materials: Solid polypropylene and rubber suction connectors at base

Dimensions: 525L x 355H x 350D

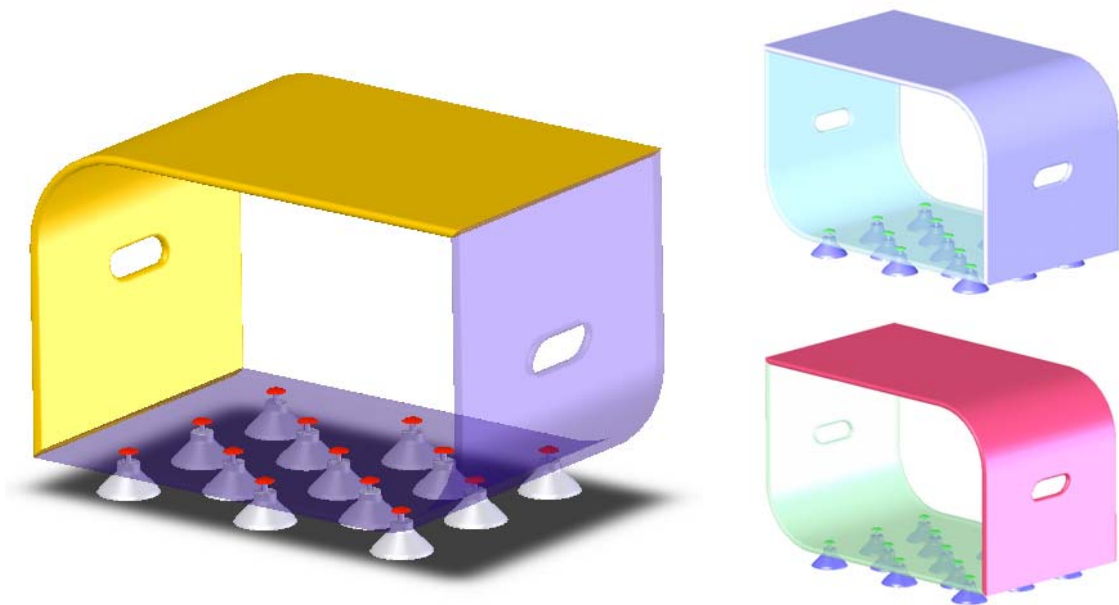


Figure 1

Design B

Materials: Solid polypropylene, multi mini-rubber suction connectors and rubber grooves

Dimensions: 525L x 355H x 350D

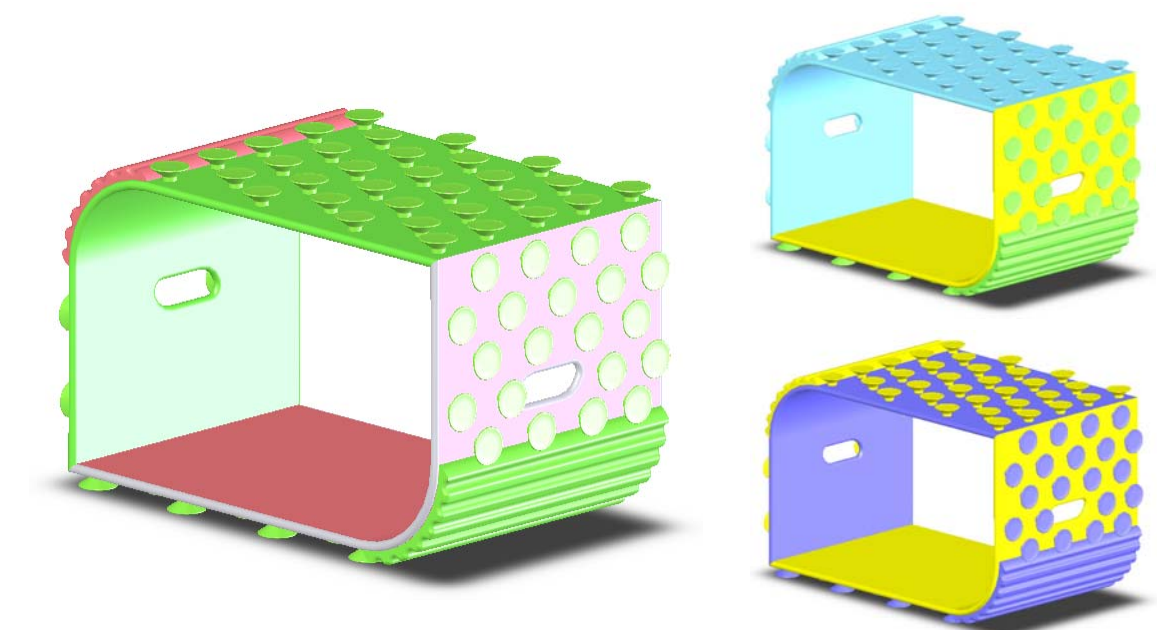


Figure 2

Design C

Materials: Solid polypropylene and rubber buffers

Dimensions: 525L x 355H x 350D

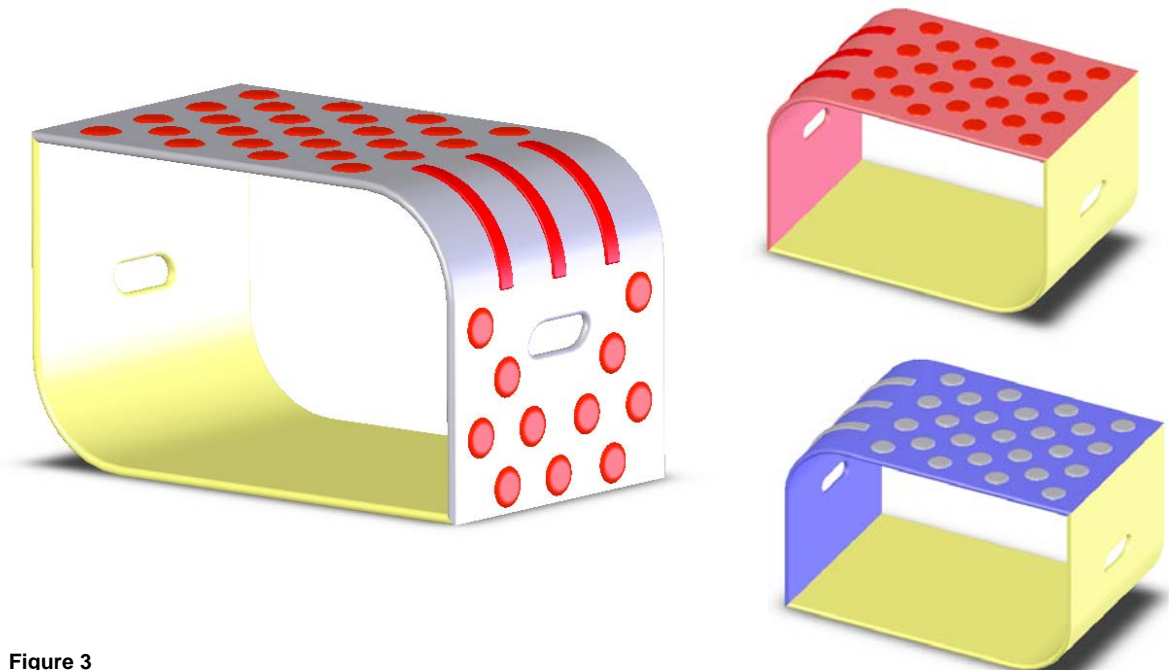


Figure 3

Design D

Materials: Solid polypropylene, rubber buffers and rubber spiked grips at base

Dimensions: 525L x 355H x 350D

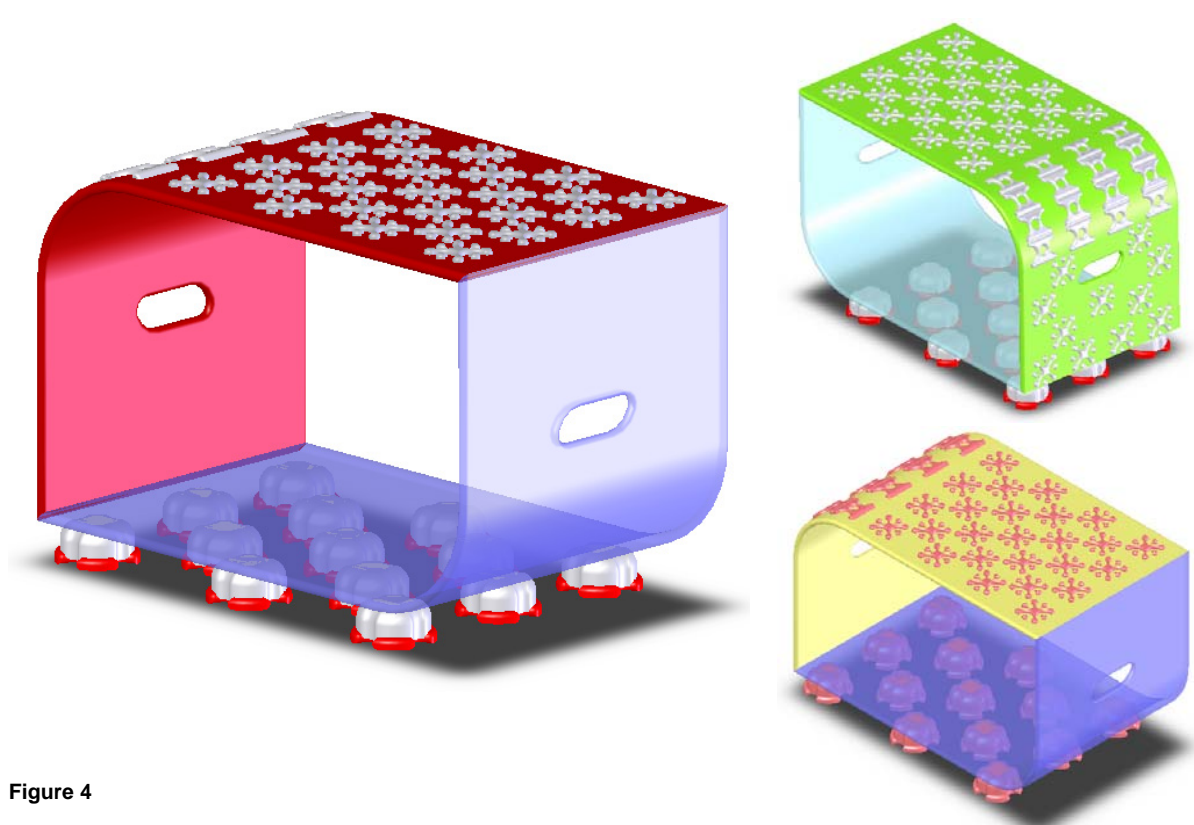


Figure 4

Design E

Materials: Solid polypropylene, rubber buffers and multi-cones base

Dimensions: 525L x 355H x 350D

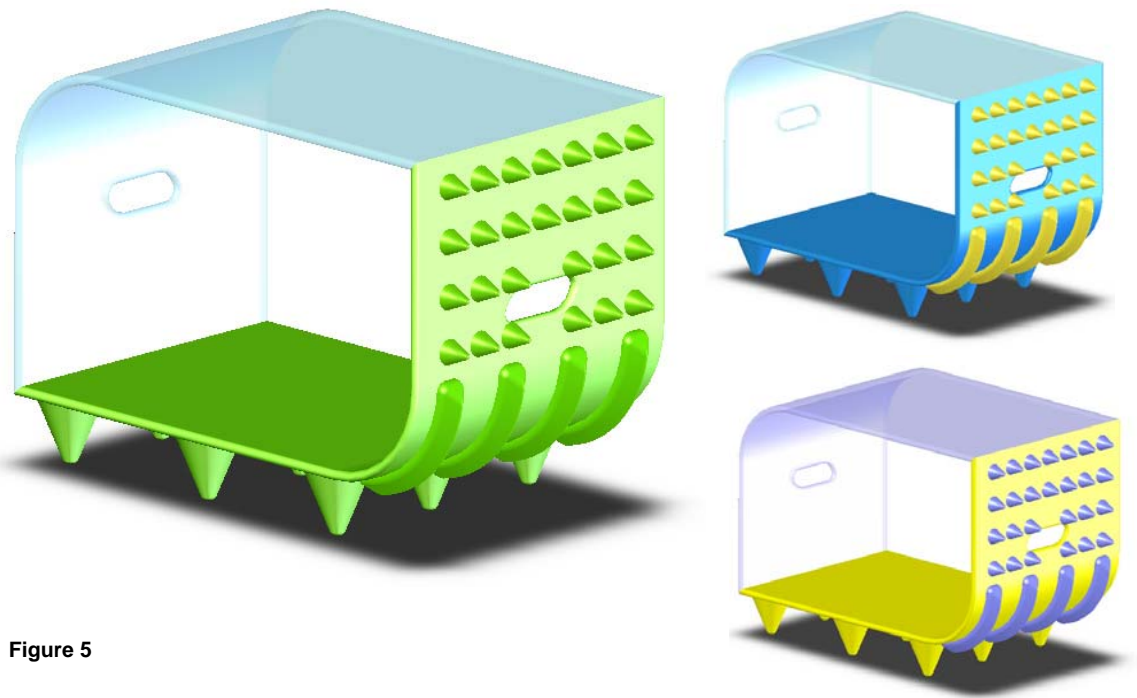


Figure 5

Design F

Materials: Solid polypropylene and large suction cups at base

Dimensions: 525L x 355H x 350D

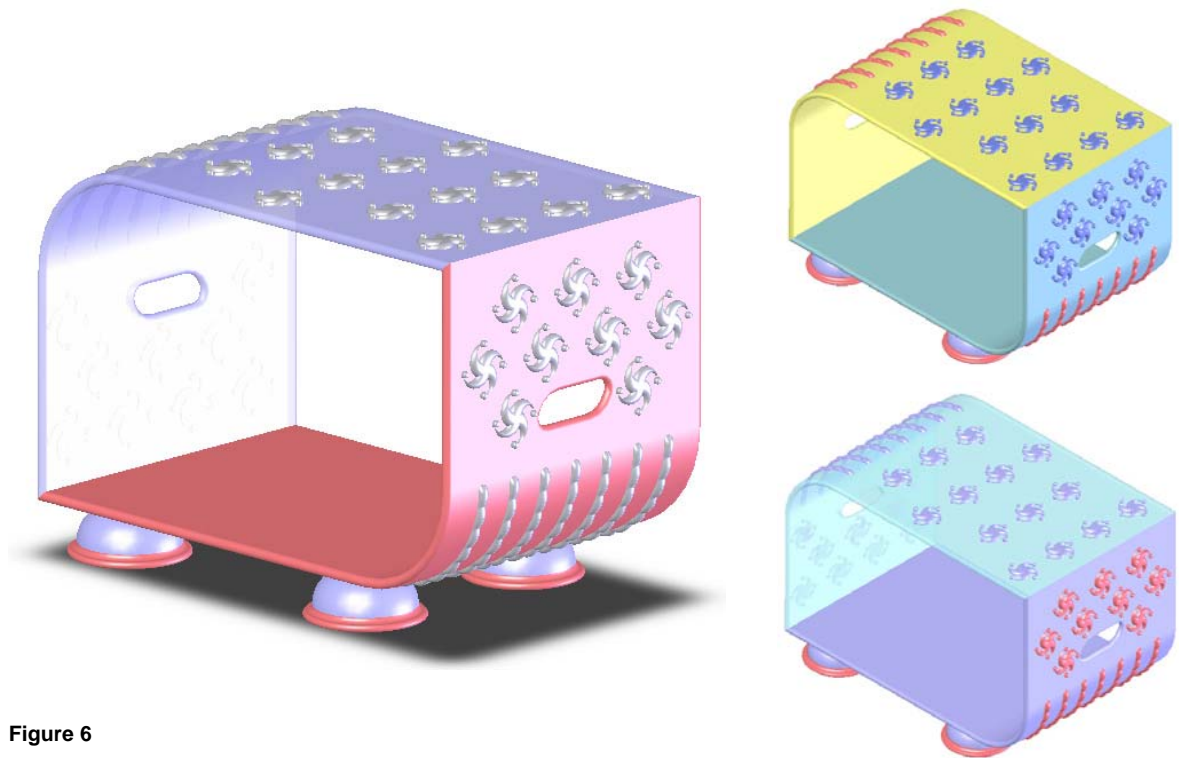


Figure 6

6.2 Shelving Configurations

Figures 7 to 13 show various configurations of the display systems. This exploration is an attempt to challenge the limitations of stacking stability through rubber features. In the shelf arrangements, multi-suction cups and buffers have the potential to offer more versatile arrangements for sculptural formation and flexible stacking. This shelving flexibility allows users to transform the shelves according to personal choices and their emotional states. The shelving configurations reveal playful forms, sculptural appearances and other possible functions. The combination of transparency and solid colour offers interesting layers of dimensionality in the shelving configurations.

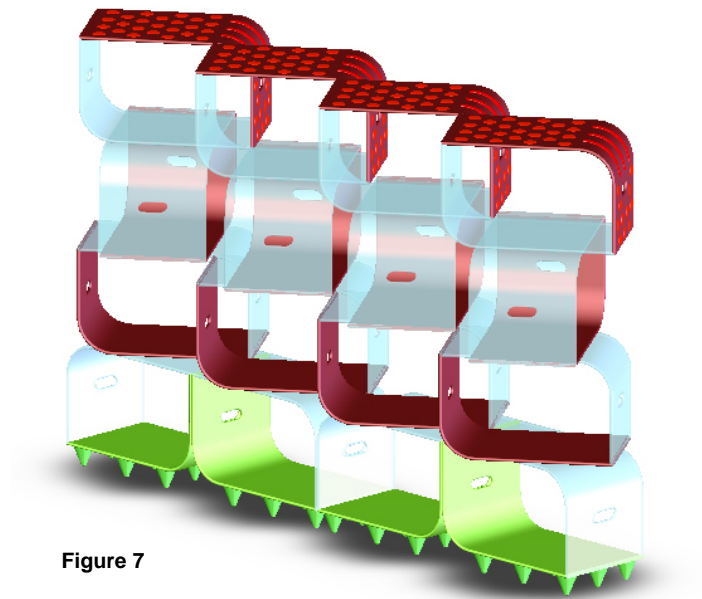


Figure 7

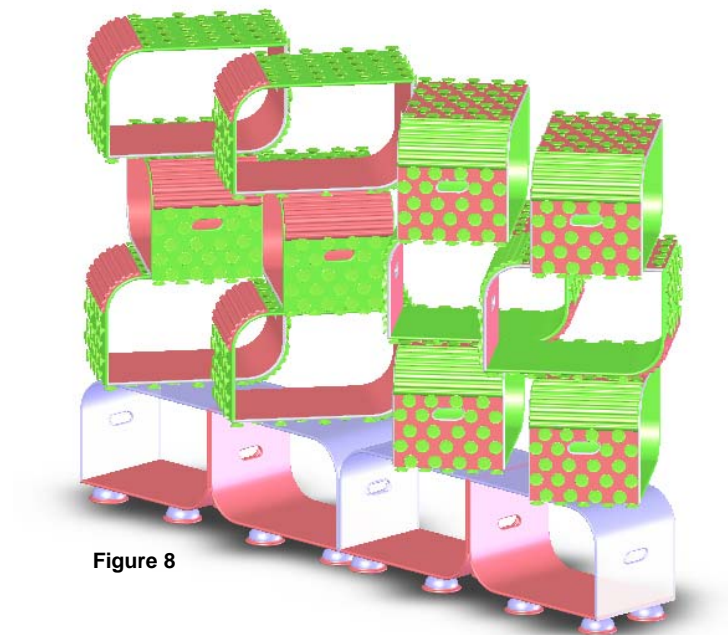


Figure 8

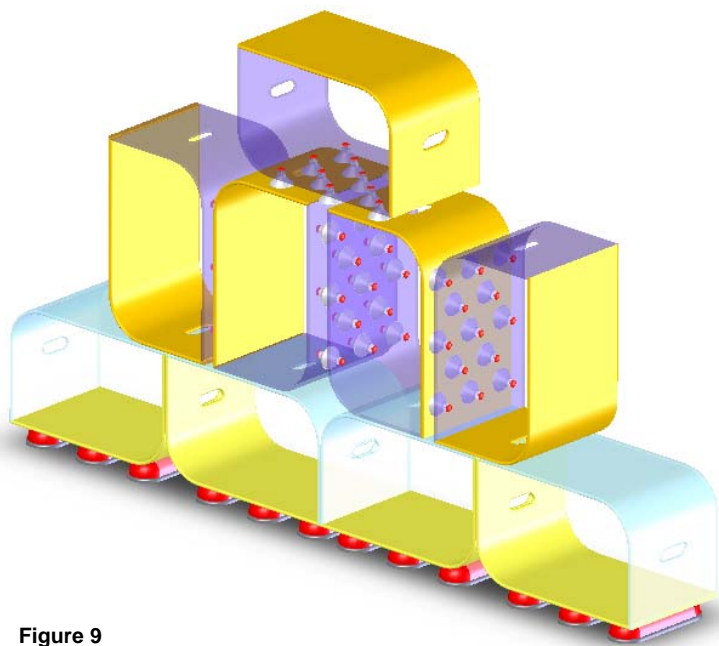


Figure 9

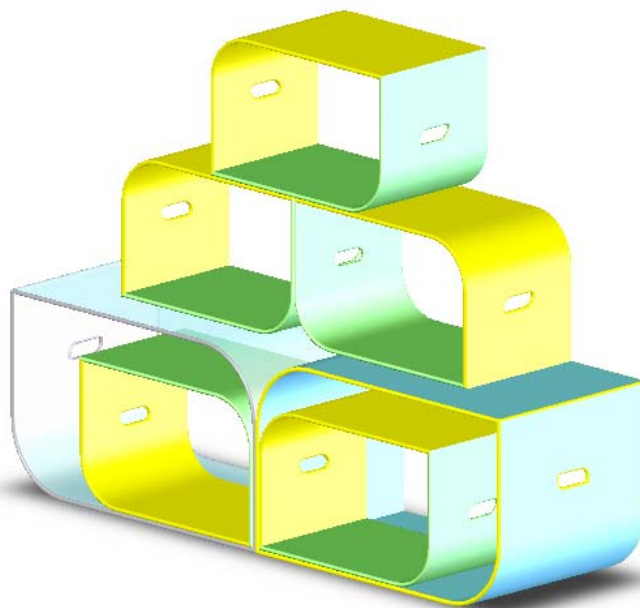


Figure 10

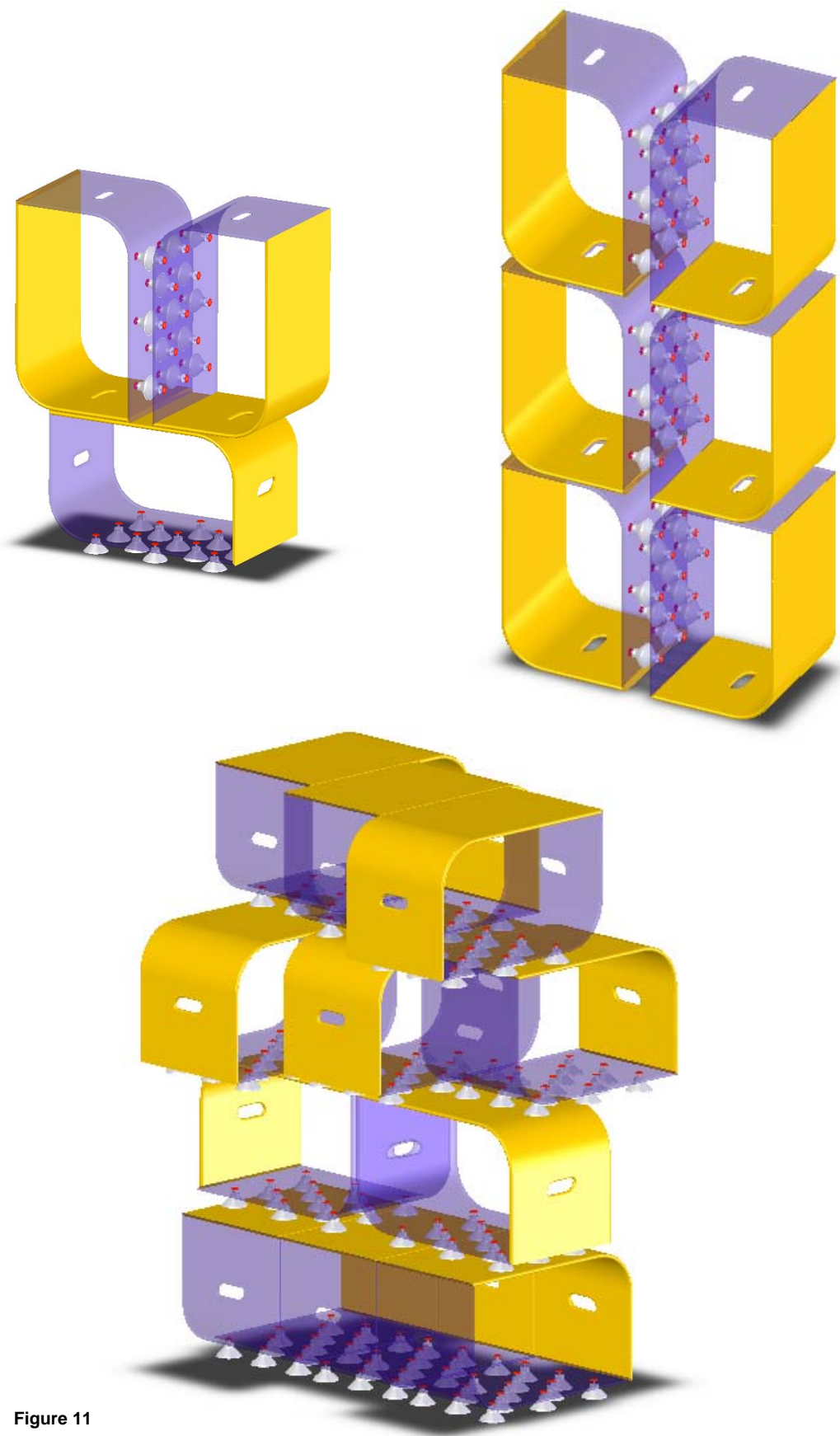


Figure 11

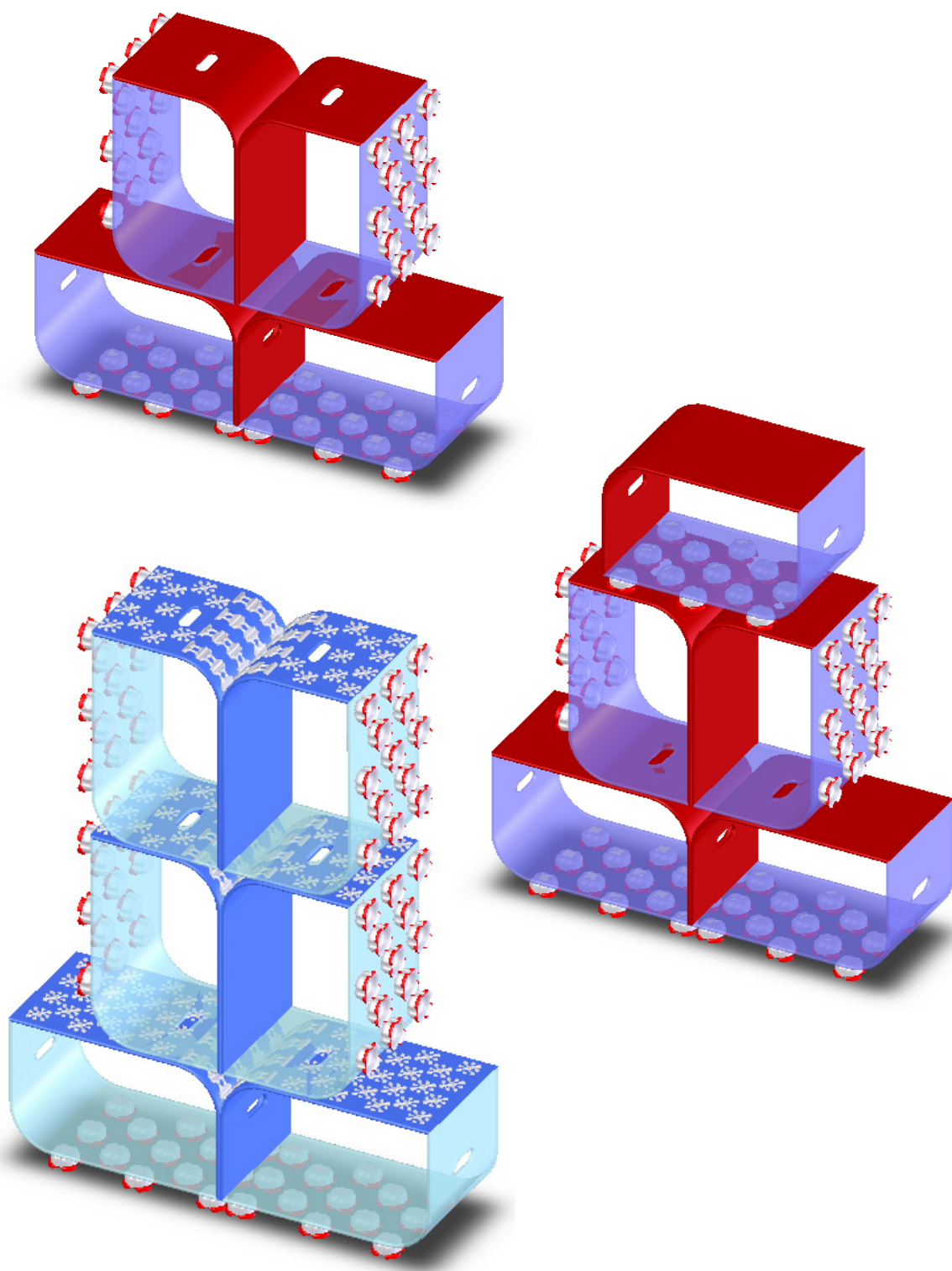


Figure 12

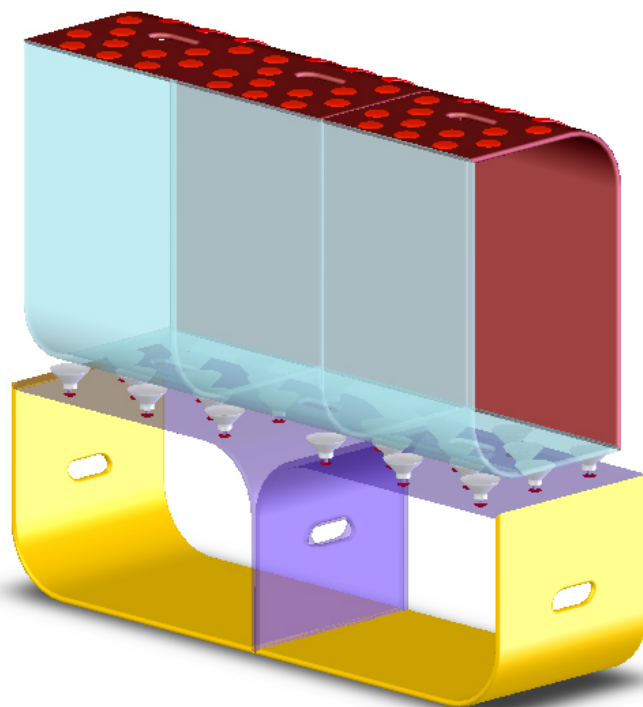
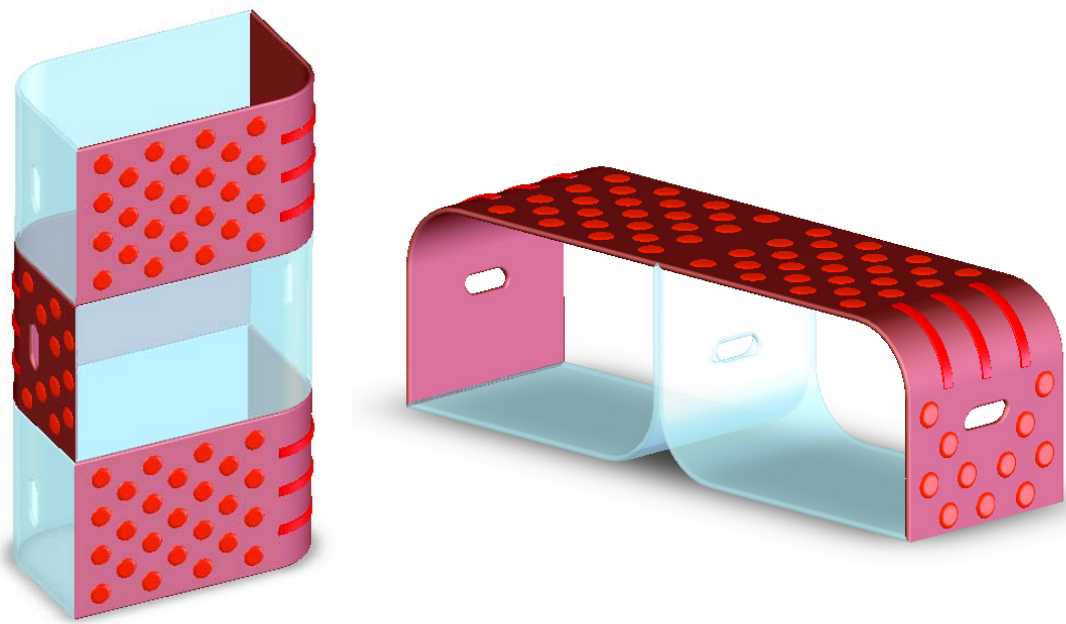


Figure 13

6.3 Spatial Applications and Other Functions

Figures 14 to 21 show the flexibility of the display shelf designs, blended into different areas in a contemporary domestic environment. Other than display shelves and open storage, the design provides for other functions and uses such as a shoe rack, bedside stand, coffee table, kid's stool, space divider and stand-alone sculpture. There are many possible extra functions the display shelves can offer, and these would depend on the user's creative imagination.



Figure 14 Foyer – Shoe shelves



Figure 15 Bathroom – Toiletry or towel shelves



Figure 16 Living Room – Divider shelves



Figure 17 Kitchen – Easy access shelves



Figure 18 Bedroom – Bedside tables



Figure 19 Living Room – Coffee table



Figure 20 Kid's Room – Stools and storage



Figure 21 Study Room – Sculpture

6.4 New Conceptual Designs

With the advantage of CAD experimentation, the basic shelving form has been extended to give greater flexibility in shelving arrangements, additional functions and spatial applications. Emotional value is added through the interesting use of materials, design features, textures and colours.

The opportunities for enhancing the emotional value are extended through the application of natural forms. The design is extended using objects from nature. Natural forms and colours from flora and natural phenomena are directly applied to the shelving design. The design intention is to associate the user or viewer with nature in a direct manner. At the same time the design enhances domestic environments.

Figures 22 to 29 show the design exploration using natural elements and translating them into display shelving designs.

Flora Shelf

Materials: Solid polypropylene and rubber suction connectors

Dimensions: 700L x 370H x 200D

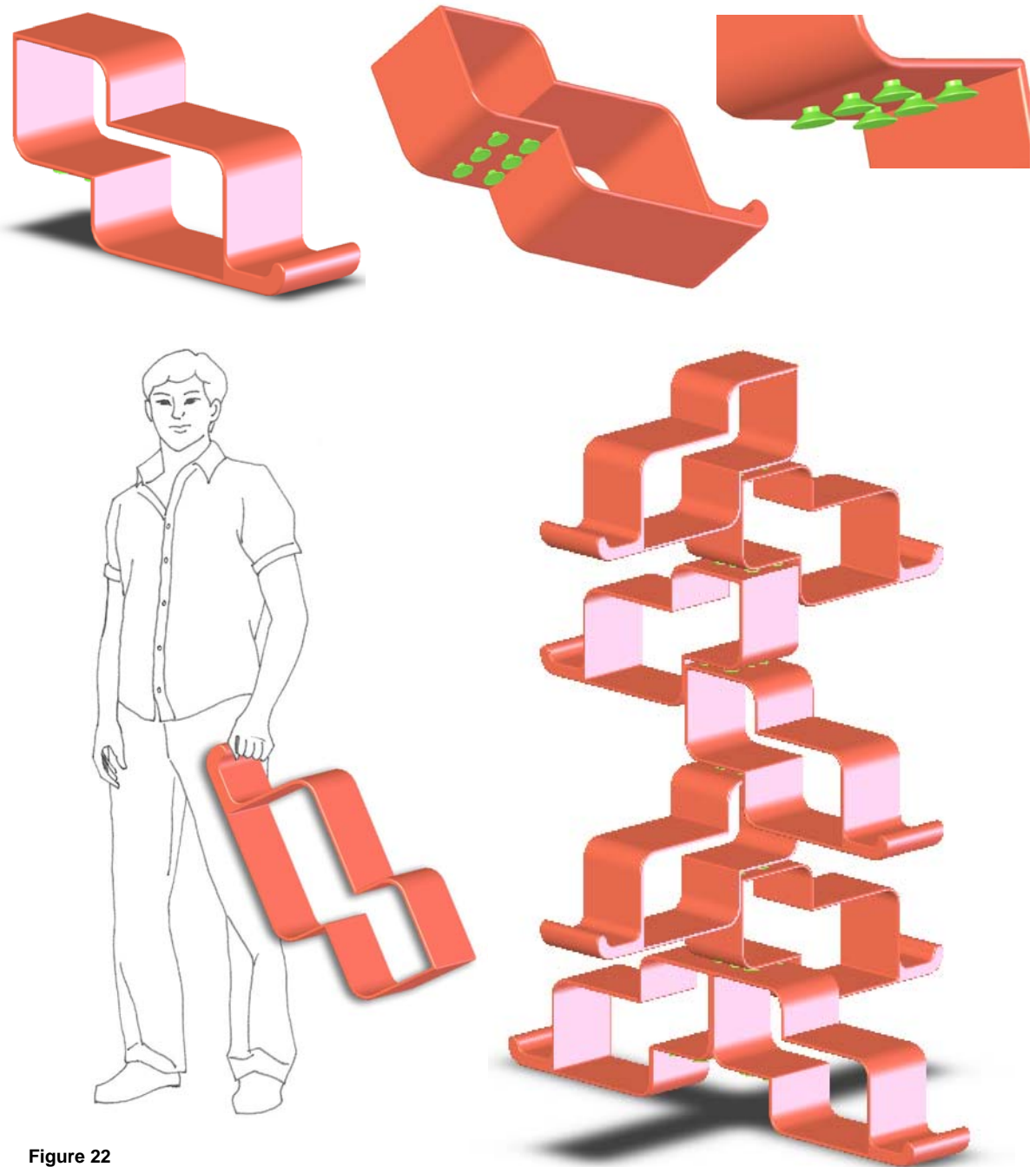


Figure 22

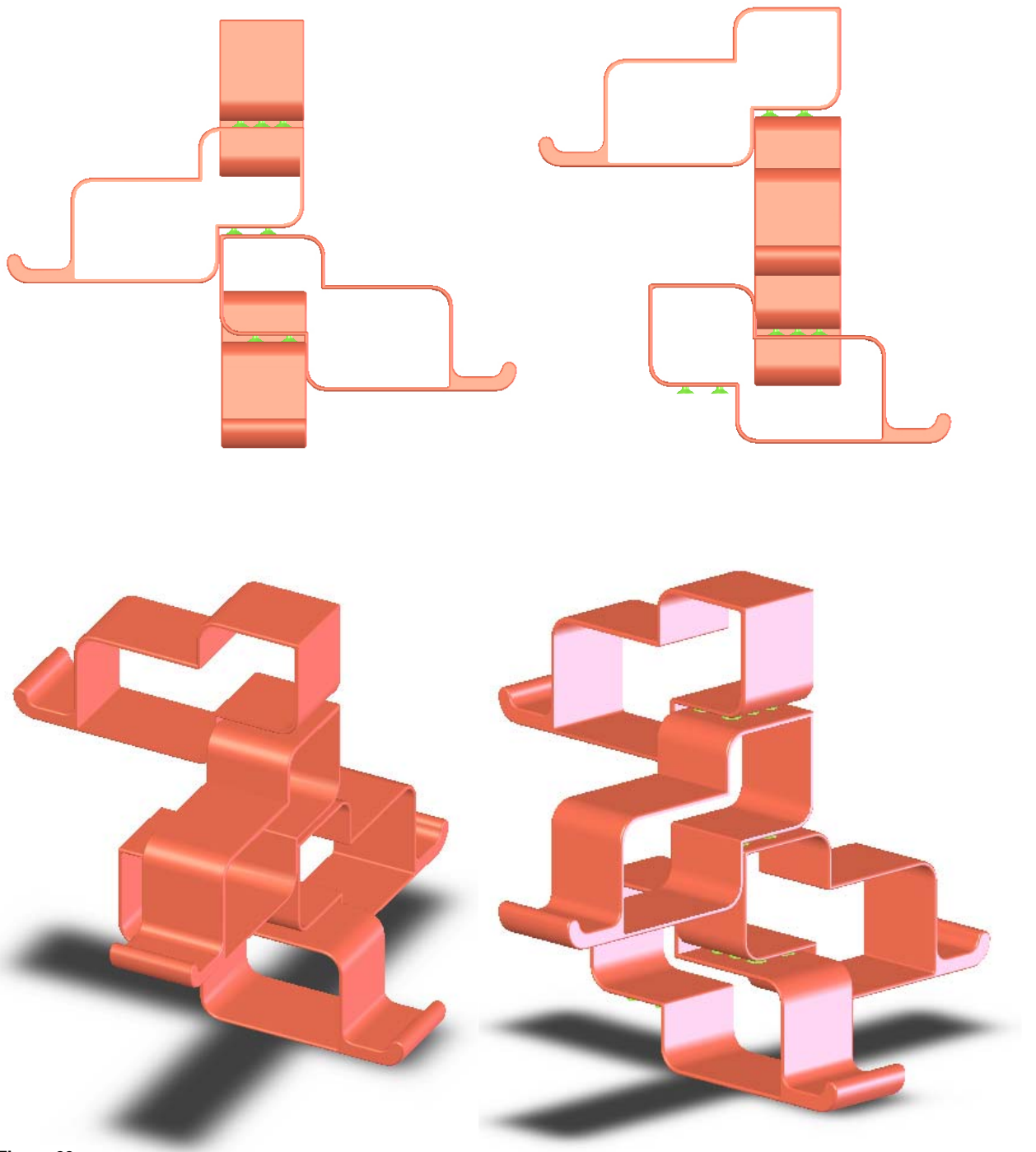


Figure 23

Waveform Shelf

Materials: Solid polypropylene and rubber button connectors

Dimensions: 600L x 350H x 350D

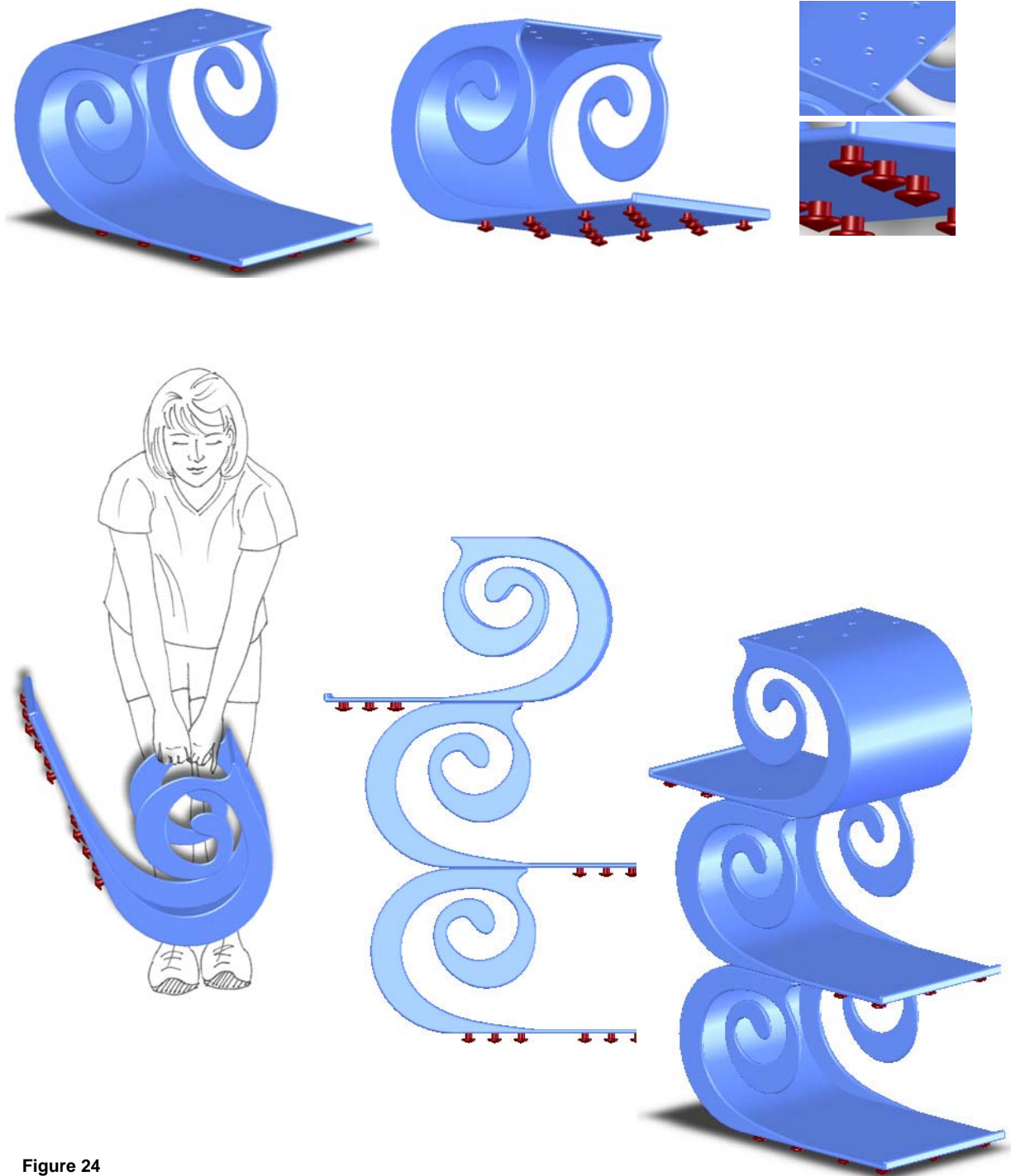


Figure 24

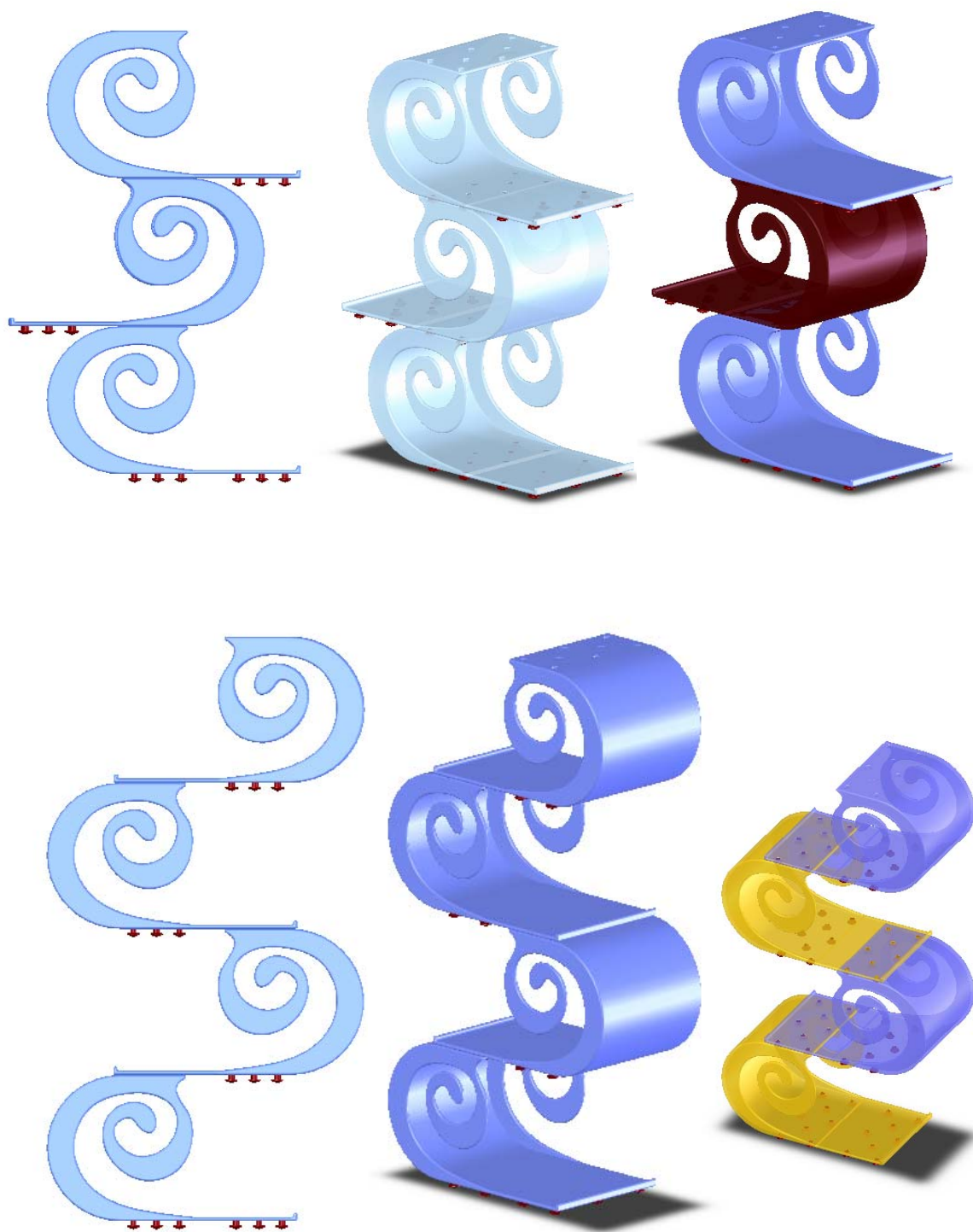


Figure 25

Foliage Hook Shelf

Materials: Solid polypropylene

Dimensions: 350L x 350Hx 300D

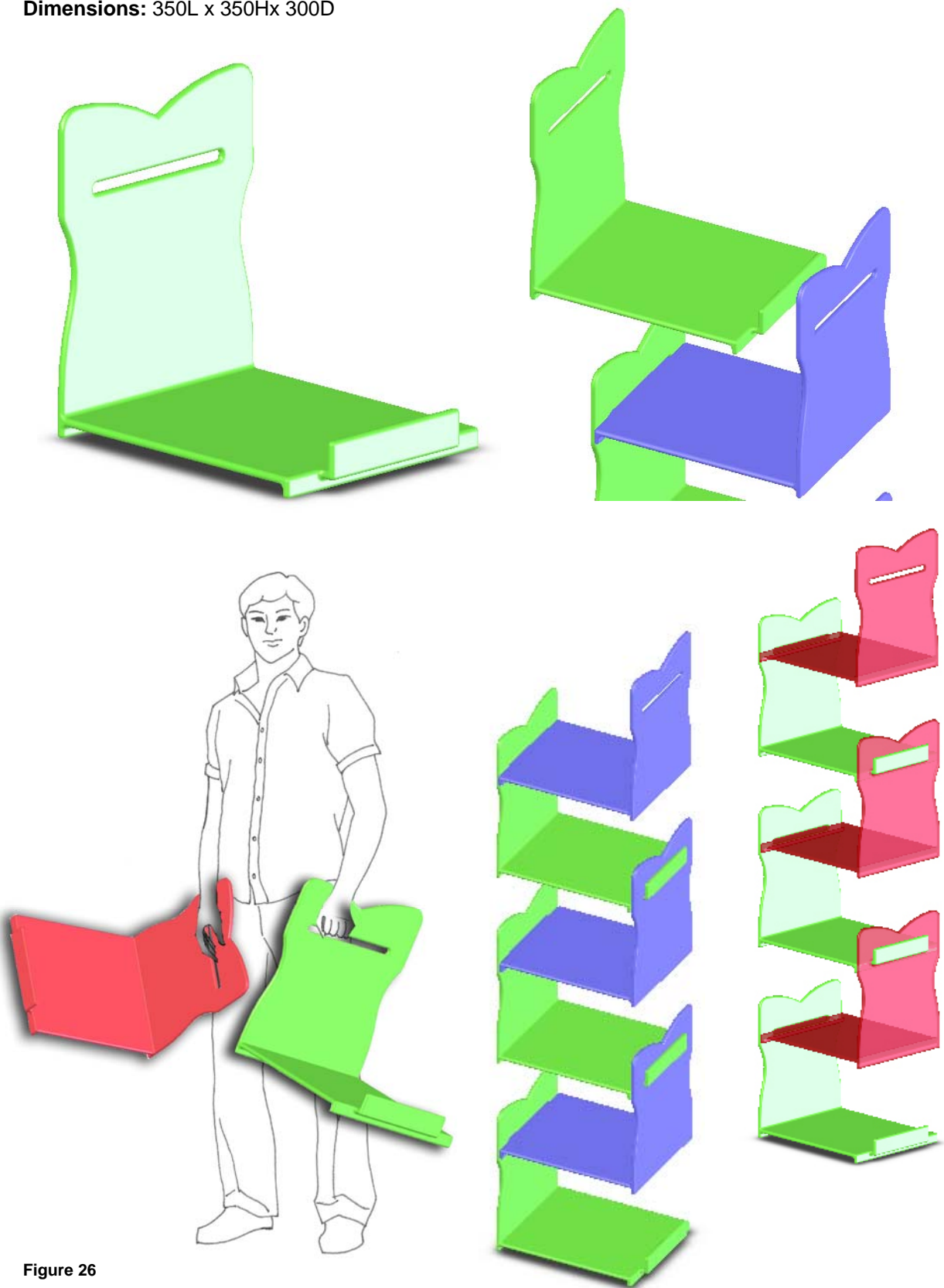


Figure 26

Seed Pods Leaning Shelf

Materials: Solid polypropylene

Dimensions: 700L x 620H x 350D

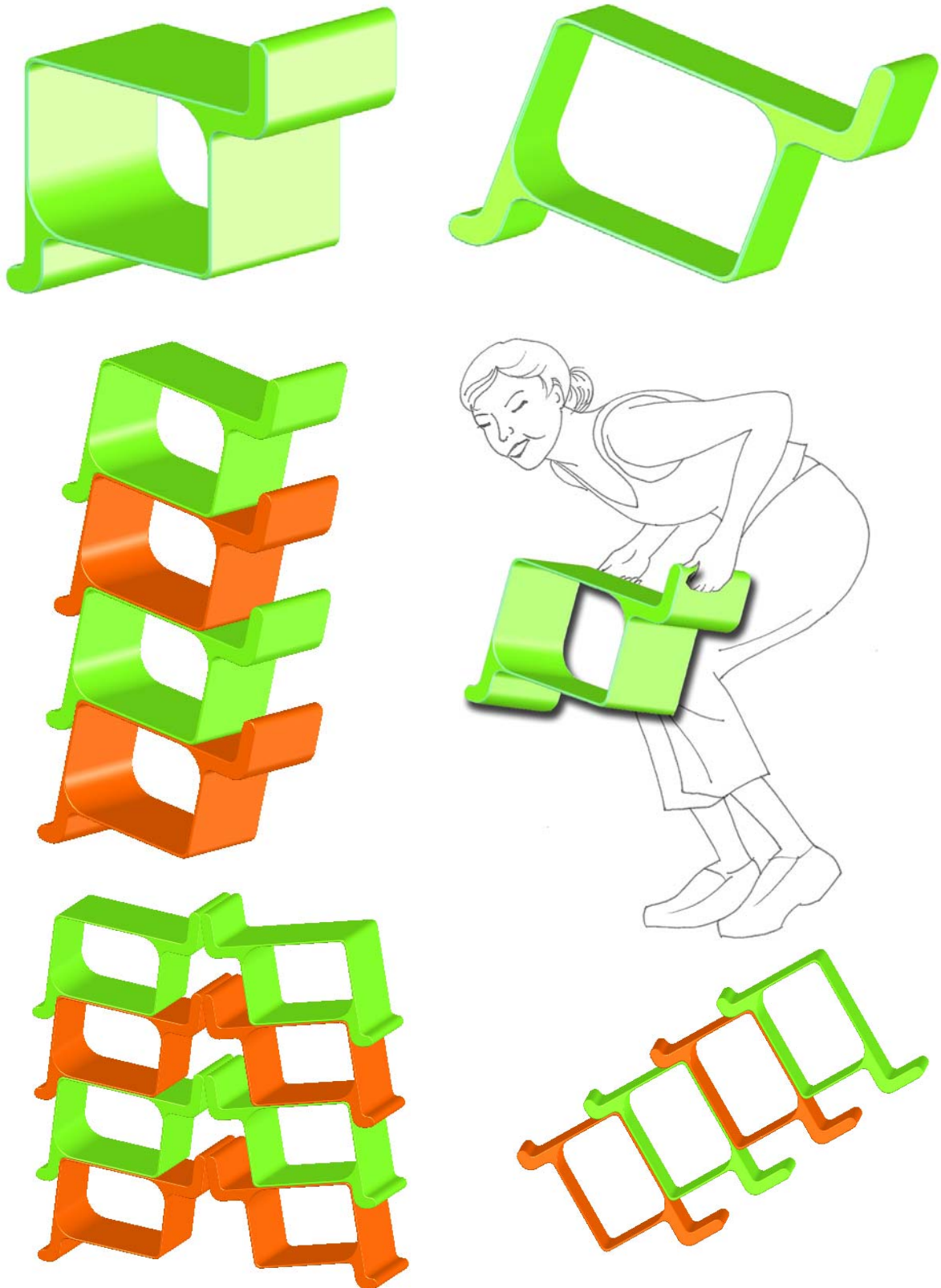


Figure 27

Flower Shelf

Materials: Solid polypropylene and rubber button connectors

Dimensions: Petal: 200L x 435H x 300D; Hub: 241.42L x 241.42H x 300D

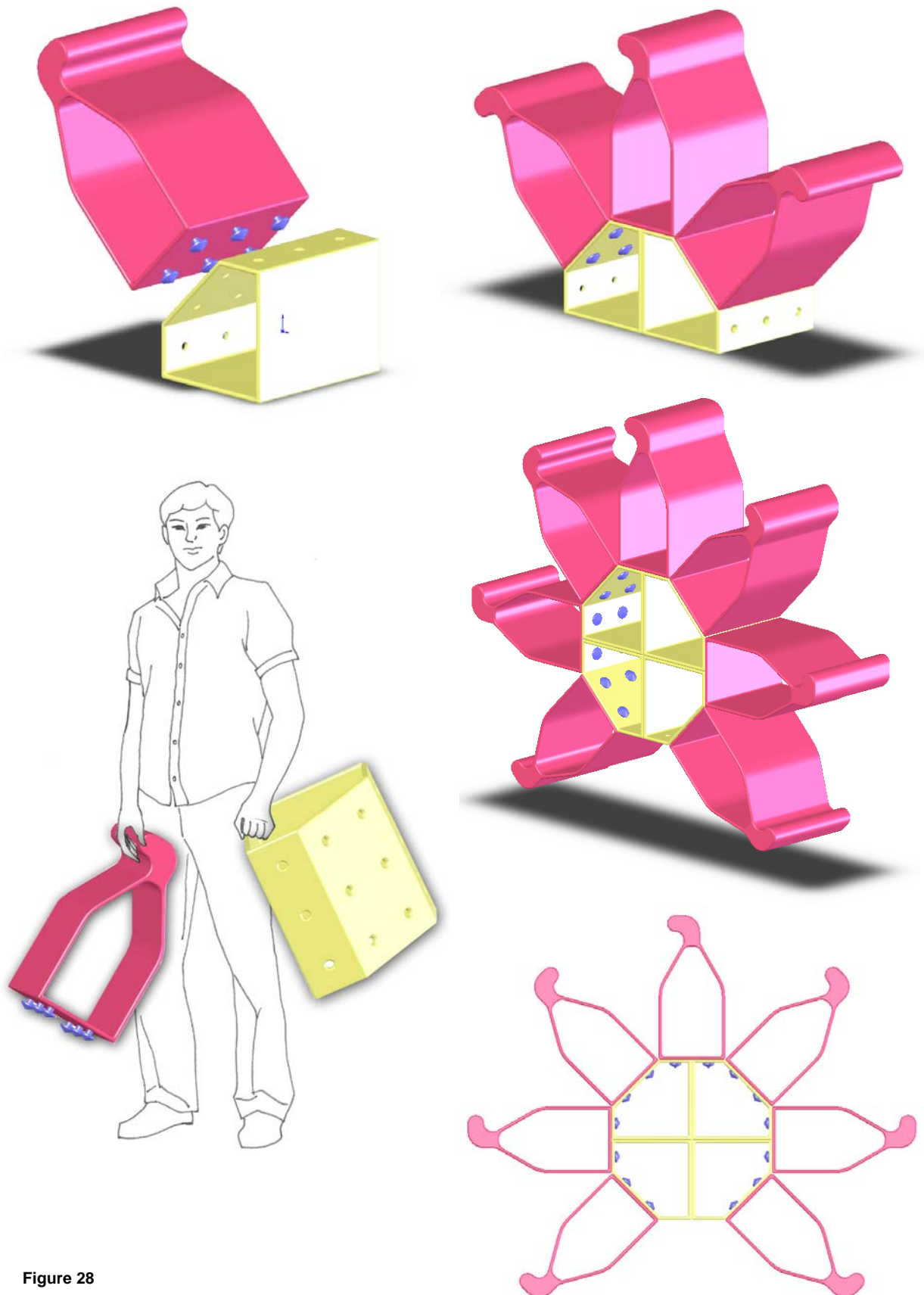


Figure 28

Shelf Extension and Stand

Materials: Solid polypropylene and rubber button connectors

Dimensions: Extension: 200L x 518.80H x 300D; Stand: 200L x 285H x 300D

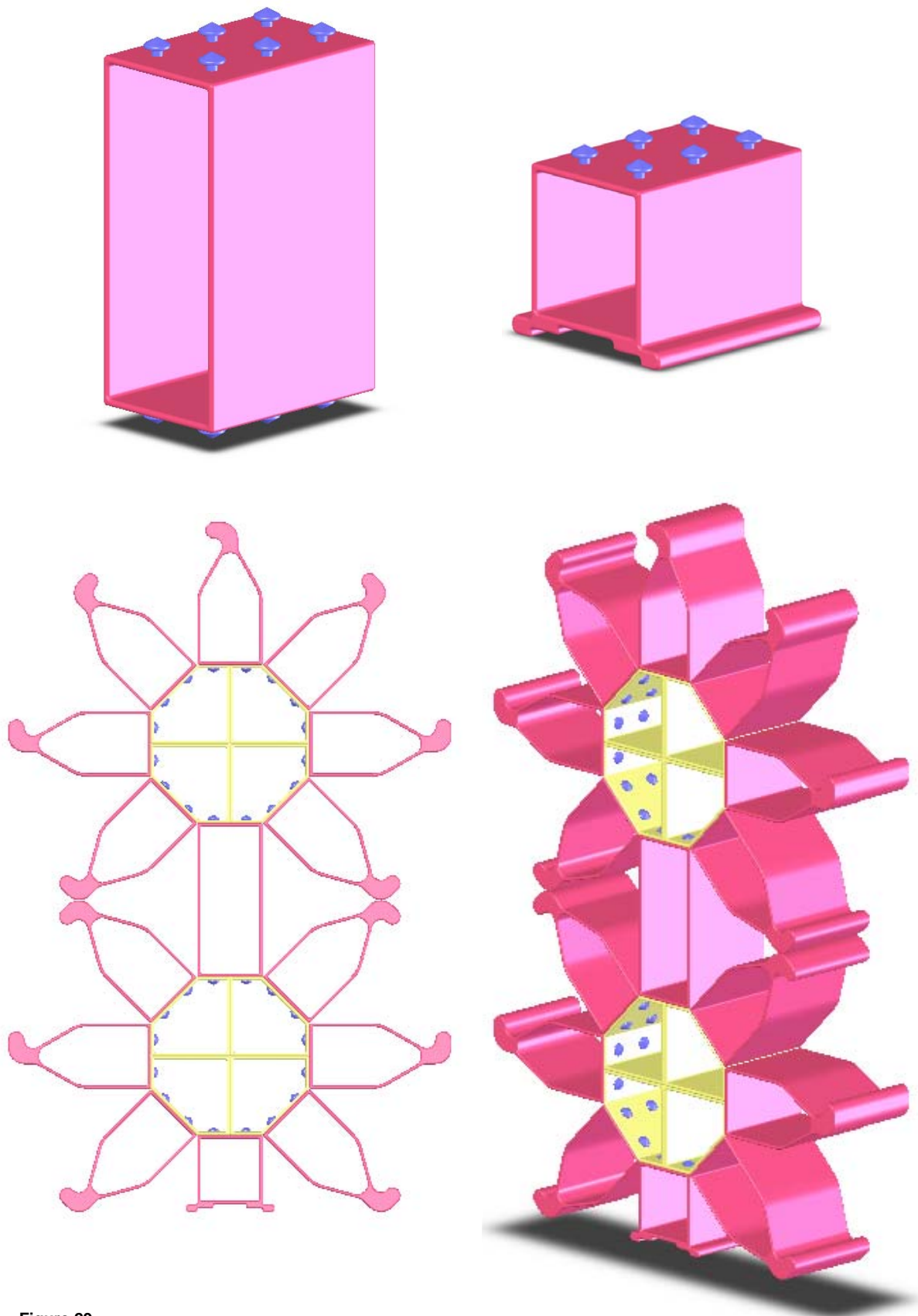


Figure 29

Chapter 7

Conclusion

The main theme of this study is that the designer must be responsive to users' emotional and functional needs. Current literature has indicated that good product design is not judged on technology and function alone. Many research studies (Jordan, 2000; Green, 2002; Coates, 2002; Norman, 2004, Cagan and Vogel, 2001) have demonstrated that a product must also satisfy the user's psychological and emotional needs.

Five prototype display shelves were used as a vehicle to test the above assumption with 80 participants in a survey, two focus groups of eight participants each and interviews involving two designers and two retailers. The following findings confirm that function and emotion are important design attributes in successful product design and development.

The questionnaire findings suggest that:

- Shelving designed with emotional qualities such as playfulness, fun and humour are desirable for participants.
- Participants tend to express a preference for display shelving that reflects their personality.
- Participants preferred display shelving that offers extra functionality of use.
- Participants feel proud of their preferred display shelf. In social interaction, people have the tendency to show off the possessions they are proud of to friends.
- The ideal location in a home for preferred shelving is the living room. The living room is most often mentioned as the center of the house, the symbolic environment of home for people. This is because their special objects are found in this space, where they can express their personality and social self. Shelving in the living room served as a focal point and at the same time enhanced the social interaction among family members and guests.

The focus groups findings suggest that:

- Incorporating emotional value into the display shelving design is as important as its function. Display shelves should not only be designed with high emotional value to draw more attention from people, but also need to be functionally usable.
- People's emotional response to a product's design attributes is personal. This reflects the person's design preferences, cultural status and life stage.

- Emotional value in shelving design is derived from its aesthetic appearance. The aesthetic appearance (attractiveness) of display shelves is the respondents' prior concern in the buying decision. An attractive display shelf has more emotional value, which plays an important role in determining respondents' aesthetic responses and purchasing choices.
- Respondents were willing to pay a premium for display shelving that looked cool, unique, fun to interact with and matched their personality. They believe this contributes to the enjoyment of owning shelving. Display shelves that offer visual and tactile interest are more desirable.
- The real enjoyment of product use comes from touching, feeling and moving around the physical objects. People's sensory responses are more reliable than visual appearance in determining shelving choice. People's preferences and taste for shelving are conveyed through the aesthetic aspect of the shelf, such as form, colour, material, surface qualities and practical elements.
- Display shelves should be designed to be different and more or less unique, to enhance the display.
- Shelving that offers more than one application is more preferred.
- The basic colours of black, white and clear in the display shelving are easy to match with the contemporary home interior.
- The modular system and portable size of the display shelves are flexible to allow multiple arrangements and are ideal for an apartment space.
- Respondents prefer display shelves with a greater range of colour and size. Colour and size, as part of the emotional quality of display shelving, plays an important role in enhancing the interaction between the shelf and user.
- Wider ranges of sizes and colours in shelving design will offer more versatility in applications and suit a wider range of users. Colour and size, as part of the emotional quality of display shelving, play an important role in enhancing the interaction between the shelf and user.

The interview findings suggest that:

- Designing a product needs to be approached holistically to incorporate function and emotion into product.
- A good product would fit into its environment. Its adaptability and functionality would trigger users' positive emotional responses.
- Product design should be a balance between emotion and function to satisfy users' emotional and functional needs.

- Emotional value in a display shelf may be derived from the practical use of shelving. Pleasure use of shelving can be derived from what it looks like or the aesthetic (visual and tactile) aspects.
- Pleasure in shelving comes from flexibility, usability and practicality. Those elements make them “beautiful”, work well, and the choice of material is important. If the shelving fits the consumer’s requirements and triggers positive emotions then they will be happy to own it.
- Consumers are happy to pay more for furniture that is attractive, interesting and usable. Consumers’ emotional response to furniture is determined by the use of material and intelligent design that constitutes its aesthetic appearance and performance.
- Display shelving design must have emotional value, such as beauty and practicality, to attract consumers’ attention and offer consumers an aesthetic experience. Product appearance and aesthetics are important in determining emotional response, but aesthetic responses vary among people due to personal emotions and preferences.
- Retailers and designers preferred simple designs with playful appearances. They believe product design should be infused with these types of elements to provide emotional value and enhance people’s living.
- Display shelving design needs to incorporate space-saving issues, joining details, and offer size and colour choices.

7.1 Overall Insights Gained from the Study

- Products must satisfy both the emotions and functional needs of the user.
- Designers must be responsive to users’ emotional needs and wants.
- Emotion adds value to a product.
- The emotional appeal of product aesthetics, such as fun, humour, delight and coolness, is as important as function.
- A product’s emotional value may be achieved through sculptural form, exciting colours and interesting characteristics of the product as well as the intended playful interaction with the product.

These findings have confirmed what much research has indicated, that designers must not design for the functional attributes of a product alone. They must also be concerned in providing emotional qualities through the use of forms, colours, materials and so on to offer the consumer aesthetic impressions and experiences

Users or consumers apply both logic and emotion when choosing a product. Therefore product designers must provide both functional and emotional elements through designing utility, flexibility, fun and humour into the product.

This research study has used a variety of methods from the social sciences to test the assumption that *emotion* is an important criterion for good product design. The findings supporting this assumption, though not entirely conclusive, are significant.

Using *emotional attributes* as design elements to elicit emotional responses, the study has proposed a variety of display shelves using different colours, textures, forms and materials. These have not been tested with the users, However, basing on the literature and the research data generated by this research, there is evidence that the creative application of colours, textures, forms and materials could change a banal display shelf into a functional sculpture to delight the sense of the users.

Chapter 2

Literature Review

Recent literature on product design research, design psychology, design theory, design aesthetics, consumer research and marketing highlight the importance of designing products with aesthetic qualities that delight human senses and make people's lives pleasurable (Bloch, 1995; Crozier, 1994; Coates, 2002; Desmet, 2002; Green and Jordan, 2002; Jordan, 2000; Margolin, 2002; Norman, 2004; Postrel, 2004; Underhill, 2000; Yap, 2001).

What values contribute to the aesthetics of a product? Coates (2002) suggests that product aesthetics come from product empathic expressions¹ (product semantics²) or product personality, from a style and novelty that delight our senses. These are the subjective qualities we perceive in a product's design that trigger our psychological responses toward its expressive character (Norman, 2004). The emotional impact of a product is determined by how we see, hear, taste and feel toward the product's visual appearance (Jordan, 2002; Norman, 2004). If emotional value is behind the claim of a product's aesthetic³, what are the objective qualities (form, material, texture, dimension, colour and so on) of a product's design that can best elicit consumers' positive aesthetic responses? This project seeks to develop an ideal form throughout the design and development of a display system. It is intended to offer consumers emotional value and positive aesthetic impressions.

In design literature there has been a lack of consensus on what comprises aesthetic value and emotional characteristics in artifacts (Routio, 1999). There also seems to be a lack of conceptual clarity as to which theoretical framework can work as a complete instrument in assisting designers to effectively design products with emotional value and successfully evoke consumers' aesthetic responses (Green and Jordan, 2002).

The important role that emotion plays in the field of product design has recently gained significant attention. Emotional design is not new, and has been challenging design practice and research for the last ten years (Design and Emotion Society, 1999). A notable example is Frogdesign. *Form follows emotion* has always been their design inspiration and philosophy (Sweet, 1999). Other firms such as Alessi Designs and Philips Design are creating product value (emotion-driven products) through striking sensual and emotive designs to provide consumers with a pleasurable experience.

¹ Product empathic expression is every perceivable aspect of form in a product, including shape, colour and texture (Coates, 2002).

² Product semantics is the expression that a product expresses through its product gestalt (physiognomic qualities or emotions that appear in a product). It is a study of the symbolic qualities of man-made forms in the cognitive and social contexts of product use and the application of knowledge gained to objects of industrial design (Adapted from Design and Emotion Society, 1999; Krampen, 1995; Krippendorff, 1995).

³ In this context, product aesthetic refers to what the product presents to our senses, especially vision and touch (Design and Emotion Society, 1999). According to Coates's theory (2003) empathic expression in product design constitutes a product aesthetic.

Their challenge is to fulfill the aspirations and dreams of consumers (Alessi, 1998; Phillips, 1999). Designers such as Ettore Sotsass, Andrea Branzi, Michele De Lucchi, Michael Graves, Arata Isozaki, Shinya Okayama, Masanori Umeda, Ron Arad, and Phillip Starck have followed this direction with their creations (Alessi, 1998; Woodham, 2004; Radice, 1985; Sudjic, 2001; Sweet, 1999).

Designers are encouraged to create a tangible art form to express emotion, which has always been described as intangible, non-functional, non-rational or non-cognitive (Desmet, 2002). Cognitive scientists⁴ who embrace usability design now even argue that emotional design may be more important and valuable to a product's success than the product's practical elements. They have suggested that emotional value is now a worthy goal of design and a worthwhile research topic to be pursued and explored (Norman, 2004).

2.1 Display Shelf as Background Object

For centuries, shelving has been defined according to a basic task, to hold or display items within a linear structure. Shelving is usually used in the background and made to be functional rather created for appearance. In this study an attempt is made to reposition the shelf as a foreground object. A series of display systems are created to serve as *stimuli* to elicit aesthetic responses.



Figure 1 Divided shelves were designed to store scrolls in an ancient library around 300 BC (Petroski, 1999)



Figure 2 Lectern-shelf on the right displayed with open codex in the fifteenth century (Petroski, 1999)

Historically, shelving design has co-evolved with books (Petroski, 1999). Books evolved from scrolls to the portable items we hold today. The shelf has evolved from a lectern-shelf to the modern compact shelves in which books reside. Shelves were shaped by numerous technological factors such as material availability, function, economy and use. No doubt the problems presented with the evolution of collections of scrolls to books also affected the design of shelves, which is why the design of shelving has constantly evolved to accommodate the diverse ways required to store and display books. The evolution of shelving design is not only influenced by the technology of books, but also by the constant changing of lifestyles.

It is believed that bookshelves have evolved from an object in which to store books to a role as an accessory (Petroski, 1999). In the high Victorian period, people of high society luxuriously

⁴ Cognitive scientists specialise in the fields of cognitive psychology and cognitive science. The field of usability design takes root in cognitive science – a combination of cognitive psychology, computer science, and engineering, analytical fields whose members pride themselves on scientific rigour and logical thought (Norman, 2004).

personalised their collections of books by displaying them prominently to represent their social status. Even today people display their favourite collections on shelves for the pleasure that is derived from them.

Furniture has become a domestic symbol after the great revolution of the Late Middle Ages. It signifies a settled lifestyle and power (Csikszentmihalyi and Rochberg-Halton, 1981). Today, shelving is considered as an accessory. It is a ubiquitous structure that is found in almost every space of the house where activities are engaged in. In a practical sense a shelf is a *self-evident artefact* (Krippendorff, 1995) that can be identified instantly for what it is; its linear characteristics allow things to rest on its horizontal flat surface.

As a utility, shelving serves its basic purpose as a container or organiser to house human possessions. It saves space by keeping clutter off the floor. Although shelving is seen as an accessory amongst the domestic furniture, it may be considered as the *vital organ* (Morgenstern, 2000) for operating a house and keeping people's lives in order. Without shelving the house would be apathetic or insentient. Thus the house becomes unwelcome to guests. As Gaston Bachelard (1958) describes it, shelves in a wardrobe are like a centre of order that protects the entire house against uncurbed disorder. A shelf serves an essential role in orderliness. The shelf and the objects arrayed on it display a relationship that is inseparable as a table from a chair, each depending upon the other. We interact with shelving, so we too become part of the interactive system, which influences how we perceive and respond to the shelf. The study considers some of these wider aspects of design to enable an exploration of the ideas that are empathic to the users.

How often do we notice the shelf in our everyday life? Psychologist Csikszentmihalyi (1995) conducted a study of what makes objects special and important to a person's life, with regards to a person's interaction with a special household object.

Objects	Percentage
1. Furniture	36
2. Visual art	26
3. Photographs	23
4. Books	22
5. Stereo	22
6. Musical instruments	22
7. TV	21
8. Sculpture	19
9. Plants	15
10. Plates	15

Figure 3 Survey conducted by Csikszentmihalyi and Rochberg-Halton (1981) of 315 respondents

The study showed (Figure 3) that most objects mentioned as important are items displayed on shelves. However shelves as furniture are not mentioned, although chairs, sofas and tables are (Csikszentmihalyi and Rochberg-Halton, 1981). This indicates that shelves seldom gain significant attention in the lives of respondents. Perhaps this is because shelving was not designed to have direct physical interaction with the owner, like tables and chairs do. Traditionally a shelf has always been designed as a functional and background object.

The table (Figure 3) shows visual art and sculpture are also considered as significant household objects by many adult respondents. In the 1930s contemporary homes, chairs and tables had

already claimed new ways of expression, becoming more organic and sculptural in contrast with the strict rectilinear form of the shelving unit (Sparke, 1986). This finding suggests that a shelf should be more sculptural or artistic in order to gain a more significant position in the home.

In most cases a shelf is conspicuous by its absence. Henry Petroski (1999, p. 5) says that “they are there, but not there.” Shelves tend to be neglected because the objects displayed on them become the focus of our attention, as if the shelves merely play a supporting role as a backdrop for displayed objects.

A book on the bookshelf is something to be taken down and read; the bookshelf under the book is something to be installed and forgotten. The one object is in service to the other, superior to the other – or such is the conventional wisdom – and the inferior object is something we seldom think about or have reason to (Petroski, 1999, p. 12).

Our interaction with a shelf is subliminal. As cognitive scientist, Donald Norman, says, “human behaviour is subconscious, beneath conscious awareness” (Norman, 2004, p. 11). In reaching the consciousness, information is processed through cognitive and affective systems in the human brain to help us to interpret (cognitive) the world and make judgements (affective) on things in the environment in order to make sense of the world (Norman, 2004).

Being conscious involves paying attention to something and requires thinking about what we are aware of, where conscious attention (Coates, 2002; Norman, 2004) arouses a reaction (behavioural) when material objects are experienced. This is the process of human response to a product that involves the three aspects of response: cognitive, affective and behavioural. However the detailed process of the human brain’s biological responses is beyond this study, though it will be briefly discussed in the next section in order to put the study into context.

2.2 Research Objectives

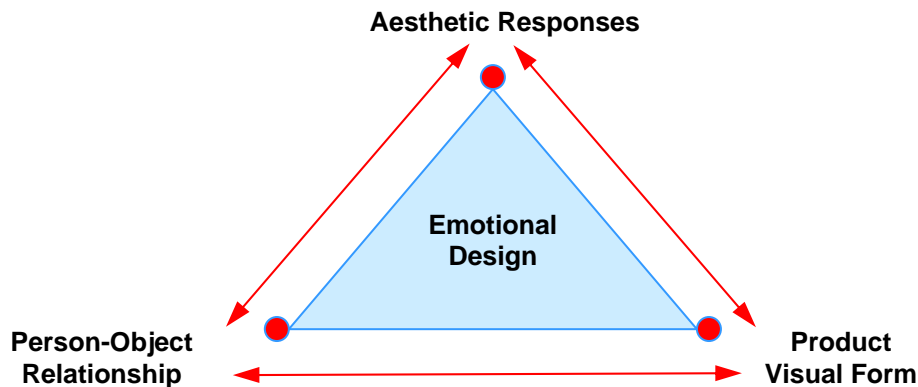


Figure 4 Research objectives

The purpose of this project is to design a display system that will appeal to consumers' aesthetic senses and elicit certain emotional chords touching on pleasure, delight, coolness, fun and playfulness. Human aesthetic responses to a product are determined by a product's visual form and the relationship between person and product. In the project the emotional qualities of display shelves are conveyed through the shelves' aesthetic form and how a person interacts with the shelving system. In the design of the display system three concepts, the person-object relationship, product visual form and aesthetic responses, are combined in the design process. In this section relationships between the concepts are discussed. This includes consideration of the visual form or the aesthetic appearance of the shelves: the look and feel of the materials that gives a tactile response. Abstract feelings, such as reflected social status are discussed.

2.3 Person-Shelf Relationship

A shelf, as a technological artefact, has two distinguishing aspects: technology and art. The former is about utility and the latter is about aesthetics (Petroski, 1999). In this context the audience's conscious attention may be built not only from the usability of the shelf, but also via the aesthetics of shelf appearance. To understand the person-shelf relationship, a product as well as a shelf must not only function satisfactorily, but must also embody symbolic quality (product semantic) appropriate to its intended user group and environment. These express something more than overt functionality (Green and Jordan, 1999).

The concept of empathy was once a neglected topic in aesthetics, but its successful application in social psychotherapy and the study of interpersonal relationships has made empathy important to design (Crozier, 1994). The empathic relationship between an object and a person is focused on

placing the viewer in the position of an artist, where the viewer projects qualities on to an inanimate object through direct experience, or they project human emotions on to it (Marcus, 1995).

In particular the symbolic qualities associated with a product may elicit a cognitive response from the viewer that symbolises the viewer's social self-image and the socio-cultural context of the product's use. The emotional response to the symbolic associations of a product is determined by the social value of the product. This may be related to the viewer's self-expressive and categorical meaning. The expressive meaning is a product design attribute that differentiates the owner's individual quality, value and unique identity from others. The categorical meaning is a product design attribute that expresses, as it were, a *uniform* and status that integrates the owner with those that surround them (Jordan, 2002). In social relationships a uniform is a sign of membership of a social group. In particular product design social preference is expressed through shared consumption symbols (Jordan, 2002). Other factors that also determine the viewer's emotional responses to a product are aesthetic impression (pleasure or displeasure) and semantic interpretation (the product's practical quality that is conveyed through its visual form). Therefore, in order to successfully elicit a consumer's aesthetic responses through the design of the display system, the above information must be taken into consideration to create tangible and emotional art forms for the display system so that its functional and social value can become desirable for consumers.

2.3.1 The Shelf as Social Symbol

A shelf, as a useful thing in our everyday life, deserves attention not only as a piece of furniture with aesthetic qualities, but as a symbol of social self-image. A piece of furniture is a product that is often heavily loaded with social significance (Jordan, 2000). It is obvious that a shelf that is beautiful and aesthetically pleasing is more likely to attract people's attention. People tend to show off their possessions to friends (Morgenstern, 2000; Norman, 2004). Things they are proud of will be displayed more prominently. For example, attractive shelves, like other pieces of furniture, play an important role in social interaction in a house because they serve as a focal point and evoke conversation between the owner and guests (Norman, 2004). This interaction indirectly enhances the self-image of the owner (Jordan, 2000; Norman, 2004). Interior decorator Carol Nafie (2005) said the focal point should be the *first thing* seen when entering a room. Therefore it should be something interesting to look at, something colourful, textural and visually appealing. It can be created by focusing on shelving design (Nafie, 2005). In the context of home décor the focal point tends to establish a theme, so perhaps the centre of attraction can be established through the configuration of the shelving associated with the objects displayed.

A shelf is like a story-teller on a stage, where personal stories are narrated openly through the personal collections on the shelf. They display a person's tastes, desires and aspirations. It can

reflect the person's creative and unique personality, as if the shelf were an extension of the self or a mirror of the soul. This relationship is regarded as an empathic metaphor (Coates, 2002). A shelf or any products that express personality are perceived as a living creature that can express emotion or attitude. The natural ability of the human to understand body language has led people to interpret the empathic expression of a product unwittingly, as it were (Coates, 2002). Norman expressed a similar idea: "humans are predisposed to anthropomorphize, to project human emotions and beliefs into anything. The anthropomorphic responses can bring great delight and pleasure to the user of a product" (Norman, 2004, p. 138). Research (Jordan, 2002) has shown that people tend to imagine a product as having personality and that they tend to express a preference for products that they perceive as reflecting their own personalities (Green and Jordan, 2002). Therefore it is believed that a product such as shelving, designed with empathic expression, will bring more aesthetic pleasure and mental well-being to consumers who see it, own it or use it.

2.3.2 Extension of S(h)elf

For many people, their furniture, pictures, and other movable objects are more powerful expression of self than is the house structure itself (Marcus, 1995, p. 9).

A house without furniture is like a senseless body. People tend to shape their personality through the things they possess, which makes their life meaningful. As a home becomes a material shelter, people who carry this belief will feel a strong sense of emotional attachment toward their home or the relationships, meanings and feelings that the things in their home represent (Morgenstern, 2000; Norman, 2004). This not only gives a sense of physical and emotional security to their own domestic environment, but also offers more control and autonomy in shaping their s(h)elves.

In shaping the self we need a shelf. The shelf both displays one's tastes and aesthetic identity, and presents a *function*: to secure one's emotion to the environment. Self discovery on a shelf gives a sense of substantial emotion for a person because a shelf is the inner sanctum of the self. Like a home, it signifies a deeper meaning and sense of attachment in a person's life.

Csikszentmihalyi (1981) says the *living room* is identified as the centre of the house, where people feel *most at home*. This is because their *special objects* are mostly found in this space, where they can most express their *personality* and *social self*. Additionally, living rooms are usually semi-private spaces that serve as a social focal point for many interactions in the home, which provides social pleasure to the inhabitants and guests. Therefore a living room is like a shell that shelters the owner's personality: by using a shelf as a focal point in living room a person's self is more easily sighted. There is not only a need for a shelf in a home living space, but an emotional need for the

owner. The relationship between shelf and home is inseparable. That's why shelves are found in almost every house.

2.4 Product Aesthetics

Many research studies (Coates, 2002; Jordan 2002; Desmet, 2002; Norman, 2004; Bloch, 1995; Postrel, 2004; Underhill, 2000) indicate that emotional responses to a product could be linked to product aesthetics such as form and colour. A product's visual appearance plays a significant role in determining consumers' emotional responses. A product's form provides visual entertainment that stirs the emotions and perpetuates existing values and beliefs by reinforcing them (Coates, 2002). This suggests that the more visual information we receive from a design, the more of our attention it attracts.

Human beings have the natural ability to interpret product expressions intuitively. This is because 93% of human communication is nonverbal, where messages are transmitted by the speaker's tone of voice and facial expressions. Only 7% of a person's emotions or attitudes are conveyed by words. This indicates that we express our emotions (feeling, meaning) and attitudes without words. Today, visual communication is recognised as the most important form of human communication (Levine and Adelman, 1993). In the context of product design, a product's emotional characteristics are conveyed by its shape, colour, texture and all the other aspects of its *visible* form, which shape what and how we feel about it (Coates, 2002). The emotional expression, as it were, of the non-living object is the mode of communication by which products express themselves visually, which also constitutes the origin of the product's aesthetics. It is believed that the emotional quality of a product may play an important role in enhancing the interaction between a product and the users (Jordan, 2002; Coates, 2002; Norman, 2004). Figure 5 below shows some products with emotional expressions.



Figure 5 Everyday household products designed with expressive features
(Left to right) Tea kettle by Michael Graves, 1999 (Graves, 2006)
Stand by Philippe Stack, 1996 (Alessi, 2003)
Infuser by Guido Venturini, 2000 (Alessi, 2003)
Coffee maker by Alessandro Mendini, 2005 (Alessi, 2003)
Citrus squeezer by Stefano Giovannoni, 2001 (Alessi, 2003)

Many designers' products have gained significant attention from consumers world wide because they have infused emotional qualities in their design. For example, everyday household products

(Figure 5) have been creatively and humorously designed with expressive *facial* features and smooth streamlined forms. These products literally *out-cool* conventional design. The product forms depict fun, mischievousness and playfulness, yet they are functional. This provides a pleasurable experience and consumers are willing to pay a premium for the added value.

2.4.1 Aesthetics Versus Functionality

Today, in the age of look and feel (Postrel, 2004; Underhill, 2000), aesthetics are pervasive and imperative and a vital element in product or service design. This results in a new emphasis in design, wherein the emphasis is shifted from practicality to aesthetic design (Coates, 2002).

Virginia Postrel, an economist, argues that:

Design provides pleasure and meaning as well as function, and the increasing demand for aesthetic expertise reflects a desire, not for function but for more pleasure – for the knowledge and skill to delight our senses (Postrel, 2004, p. 179).

This echoes Coates:

A product's empathic expression, as determined by every aspect of its visible form, is unquestionably also determined by the designer (Coates, 2002, p. 102).

Consumers are more aesthetically conscious than ever before, and are willing to pay more for a product with beauty. This has become a selling point for marketers. Therefore, in attempting to meet the consumer's wants, the designers are the ones in the product development team who are responsible for the inclusion of aesthetics.

Functionality is still important: it contributes to the usability of a product in its general form. In defining the deeper meaning of function in the design context, function can be viewed as a *noun* and a *verb* (Good and Good, 2001). Function as a noun is synonymous with the purpose for which a thing was designed. Whereas function as a verb, has no regard for whether a thing is designed for a particular purpose or not: it can function in a number of ways. Therefore the study examines how extra functionality in a shelf can be identified not only by its practical value (shelving, storing or displaying objects for orderliness), but also by its aesthetic qualities (to be gazed at and touched for its novelty) or other aesthetic potentiality. That is, the study examines how a shelving design could offer extra functionality and evoke positive emotions in the user through visual or tactile sensation, and how these are associated with its material properties. However, even though there is a focus

on the aesthetic potential in shelving, there is also an attempt to balance function and emotion in the shelving.

Shelving is generally seen as an organisational system that keeps human possessions in order. Julie Morgenstern (2000), a professional organiser, pointed out that most people find organising things an overwhelming, hopeless, boring chore. The problem is that very few people put much thought into the *aesthetics* of their organising system. Her advice is to design a system that is simple, fun, and visually appealing so that it reflects the person's creative and unique personality (Morgenstern, 2000). She says transforming a dull organising system into sources of visual and tactile pleasure can make people feel good, which in turn facilitates the ease of accessing and retrieving items on shelves. So, beautiful things work better! This is manifested in what Norman advocates: "Attractive things work better" (Norman, 2004, p. 17). Based on Norman's findings, aesthetics play an important role in product design. In his research on the affective impact and behaviour of users, he claims that the negative affects of situations can make it hard to do even easy tasks, whereas positive affects from other situations can make it easier. Therefore, when people are in a relaxed situation (positive emotion), the pleasant and pleasurable aspects of design make them more tolerant of difficulties and problems (Norman, 2004).

In summary the enjoyment (positive emotion) a person gains by interaction with attractive and fun designs can facilitate the person's ability to cope with stress. After all, making things beautiful or interesting is as valuable as making things work better.

2.5 Aesthetic Responses

Design theorists Coates (2002) and Jordan (2000), design psychologists Crozier (1994) and Norman (2004) and market economists Bloch (1995), Postrel (2004) and Underhill (2000) have said that people's preference and taste for a product should be communicated through the product's aesthetics. In the context of product design, aesthetic stimuli relates to the feelings and sensations experienced by the consumer and what a product's appearance presents to the viewer. Aesthetic stimuli involve all our senses: vision, hearing, touch, taste, smell and emotion (Crozier, 1994; Jordan, 2000; Coates 2002; Norman, 2004).

In product design touch is almost as important as the visual form in determining the preference of a product; we cannot like a chair without actually feeling it. Objects should not just look good, they ought to feel good as well. Emotional or sensory design has an increased aesthetic potential, therefore it has a greater ability to excite the user's senses when interacting with a product (Coates, 2002).

Aiming at two key senses – sight and touch – the study examines the design and material properties that contribute to the consumer's delight in a display system that is aesthetically pleasing to them. Today, consumer expectations of a product's aesthetic values are not only met by the product's functional characteristics, but their emotional need to feel and physical need for sensory stimulation (Zaccai, 1995). This conscious experience is known as aesthetic experience (Csikszentmihalyi, 1991), which embodies the experience of sensations, directed and concentrated attention, emotions or feelings, urges to act, thoughts, and appraisals ranging from indifference to good or bad (Coates, 2002)

These concepts prompted the design of a display system with aesthetic qualities that may delight people's senses. These reactions are termed *aesthetic responses* (Crozier, 1994; Bloch, 1995). Aesthetic responses may relate to pleasant or unpleasant feelings from the visual perception of or tactile interaction with a product. Some product designs elicit a mix of emotions, such as positive and negative responses at the same time. However humans instinctively approach products that promise pleasure and avoid those which threaten displeasure (Coates, 2002; Norman, 2004).

In order to fulfill the consumer's aesthetic needs with the emotional and sensory design features they prefer, it is important to investigate and quantify the consumer's aesthetic responses in their choice and evaluation of a product and which information they use or ignore.

2.5.1 Subjective and Objective Responses

In the study, the aesthetic responses of consumers encompass two factors: subjective and objective responses (Bloch, 1995). Subjective responses are related to *visual aesthetics*, the visual sensations perceived by the user and the user's association with a product's subjective qualities of design or visual form, such as beauty, novelty, personality or fashion. Objective responses are related to the *tactile aesthetic*. This is the physical sensation felt by the user when they interact with a product's objective qualities of design, or physical properties, such as surface quality, shape, size, colour, finish and the thermal capacity of the material (Jordan, 2000). In both instances there are other factors that may come into play.

Design for visual aesthetics is reliant on a product's physical form or shape. Whereas design for tactile aesthetics arises from the intelligent use of materials, texture or surface finishes. Products designed with visual aesthetic qualities may elicit an immediate emotional reaction due to attractiveness or unattractiveness, beauty or ugliness. Norman (2004) argued that attractiveness is judged on the product's surface whereas beauty is judged below the surface because beauty is influenced by conscious experience such as knowledge, learning and culture. People may enjoy an object that looks unattractive on the surface, or ugly art can be beautiful to them. Also owning an aesthetically designed product may facilitate social integration and influence others' perception of the owner's self-image. Products with tactile aesthetic qualities provide sensual experience to the user during interaction. The real pleasure in product use comes from touching, feeling and moving the physical objects (Norman, 2004).

The study addresses responses elicited through interaction with a product, responses based on visual and tactile stimuli, to satisfy consumers' emotional needs and aesthetic values. Designing products with visual and tactile aesthetics delivers aesthetic benefits (Yap, 2001). These benefits offer sensory and positive experiences to consumers' association with a product's visual form and material properties. A utility shelf deserves an individual's attention but fails to capture these elements. The study seeks to reverse such perceptions by bringing the shelf from its position as inferior backdrop to the superior front stage, transforming it into a more artistic, functional sculpture, infused with potential aesthetic qualities that capture the consumer's attention and provide positive aesthetic experiences.

All of these elements are shaped by the designer. Therefore the human response is controlled and determined by the designer because they are the form provider and conveyor. It is the designers who communicate with their audience or the consumer by shaping belief (Tyler, 1995) and design intention.

2.6 Understanding Potential Consumers

People are more than just *users*. They have hopes, fears, dreams, aspirations, tastes and personality. Their choices of products and the pleasure or displeasure that products bring to them may be influenced by these factors (Jordan, 2000, p. 205).

The *new consumers* who have revolutionised the world of business, culture and social expectations are now confined by their interests, lifestyles, attitudes and aspirations (Lewis and Bridger, 2001). This factor is called *psychographic* (Tiffany, 2005). Psychographic profiles are commonly used as an efficient strategy in market research to understand and explore people's needs and wants (Tiffany, 2005). However, in the design industry and marketing theory, *wants* are more powerful than *needs* in determining the success of a product. This is because *needs* are determined by the task, whereas *wants* are determined by culture, by advertising, by the way one views oneself and one's self-image (Norman, 2004). Papanek (1994) thinks that people with genuine needs are usually more difficult and less profitable to satisfy than the *wants* that are inculcated by fads and fashion. This is because people prefer to seek crowd pleasure (Papanek, 1994) that gives them a sense of security in crowds and crowdedness.

To understand potential consumers, the study will examine generational differences by looking at common characteristics such as buying behaviour, lifestyle and desire based on assumptions made by marketers (Neuborne and Kerwin, 1999; Robert and Manolis, 2000; Lewis, 2001; Payne, 2004; Trendwatching, 2004; Partners & Levit, 2004; Tiffany, 2005; Alarab, 2005) in order to identify *wants* from design attributes.

The relevant generational groups are the Baby Boomers and Generations X, Y and C. Based on marketing results, the psychographic profiles of the generational groups are categorised as youth-seekers, individual-seekers, fun-seekers and symbolic-seekers. Youth-seekers are consumers who desire to see themselves as young, and enjoy exciting, youthful, vibrant, aesthetic designs. Individual-seekers want products that are unique, to reflect their individuality, and like to be seen as the first, to stand out from the crowd. Fun-seekers are very experimental. They look for excitement, and like products that are fun, fast and colourful. Symbolic-seekers look for self-expression through product features and consumption.

Psychographic Profiles	Generation Groups			
	Baby Boomer	X-ers	Y-ers	C-ers
Youth-seeker	✓			
Individual-seeker		✓	✓	✓
Fun-seeker	✓		✓	✓
Symbolic-seeker		✓	✓	✓

Table 1 Psychographic profile of generation groups

Table 1 is a summary of the psychographic profiles of the generational groups. The table shows that the four generations share similar psychographic profiles to some degree. Baby Boomers desire to see themselves as young and seek fun. They share the fun-seeker profile with Generation Y-ers and C-ers, who are looking for a product with design features that reflects fun and excitement. This is because many of the baby boomers had gone through the popular culture in the 60s and 70s, an era that emphasised the value of youth. However, Generation X, the uncontrollable (Pantzar, 2000) and cautious (Partners & Levit, 2004) consumers, are individual and symbolic-seekers, and also shared a similar profile with the younger Generations Y-ers and C-ers who like products that look and feel different and that reflect their individuality and are symbolically important to them. Generation X-ers have their own way of interpreting market message and fashion (Pantzar, 2000). They are careful with their purchase decisions and value family life. A survey (Quality of Life Research Team, 2003) found Generation X-ers have the major impact on furniture purchase, because the rate of homeownership in this group is higher than for the baby boomer generation at an equivalent age. Lastly, Generation Y-ers share almost the same characteristics with Generation C-ers, except Generation Y-ers' buying choice is driven by faddishness and rebellion and they are also influenced by their friends' decisions (Neuborne and Kerwin, 1999). To attract young buyers, many products, such as Apple's iMac, tend to look less industrial by using bright colour and rounded and cool design (Alarab, 2005). However Generation C-ers are 'prosumers' (Trendwatching, 2004) as perceived by marketers: they are creative and well informed. They are open to social and technological changes and have greater control over what they buy (Trendwatching, 2004).

Renier Evers of Trendwatching, (Payne, 2004) says that society today is ready to embrace the change; it is craving for the new, the excitement and the youth. The things we consume shape our identity because we live in a society of consumption and meritocracy (Tiffany, 2005). More and more consumers are looking for uniqueness (Tiffany, 2005) to *outcool* their friends. People have come to view this as a form of self-expression. Consumer desire for uniqueness has led them to hunt for truly unique items. In the consumption context, a product's unique form has the ability to grab viewers' attention because of the novelty of its design (Bloch, 1995; Coates, 2002; Postrel, 2004). Novelty constitutes an aesthetic stimulus that is directly responsible for sensations, feelings and thoughts that urge the consumer to respond (Bloch, 1995). The profile information provides a valuable guide for the development of the display system design to meet the emotional needs of these generations' profiles.

2.7 Sources of Inspiration

Sources of inspiration play a variety of significant roles throughout the design process in the study. The sources of inspiration are mainly derived from natural organic forms in nature, photographs of Memphis designs, casual observation of existing display-system designs on the market and brief design conversations with designers and retailers.

Nature is a rich source of ideas. Natural forms are adapted to create different kinds of design elements. Human beings inherently prefer forms that resemble nature (Mayall, 1968; Dorczi, 1981; Papanek, 1984; Crozier, 1994). Natural forms like plants, animals and other living creatures, as well as natural phenomena such as snowing and winds or thunderstorms, provide inspiration. These elements are used and translated into new display systems.

Reference to images of Memphis designs and influences provides an indication for the mood and design of features in the display system. The casual observation involves documentation and analysis of existing display shelving from market designers. The information helps to inform new designs by providing understanding of shelving design development, use of new technical features and design elements. Casual conversation with designers and retailers helps with understanding market trends, contexts of use, and needs of target consumers.

2.7.1 Emotional Forms

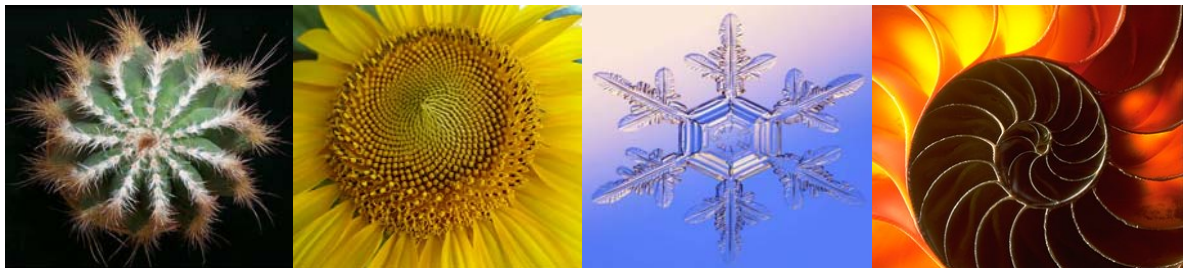


Figure 6 Natural forms follow the organic principle. Their mystical spiral, rhythmic and streamlined elements influence people's design preferences and tastes
(Left to right) Cactus (Dor, 2003)
Sunflower (Shongrunden, 2002)
Snow crystal (Handwerk, 2004)
Nautilus section (Murphy, 1993)

A product's emotional value contributes to the product's aesthetics (Coates, 2002). It is determined by how we see, hear, taste, touch and feel toward the product (Jordan, 2002; Norman, 2004). In emotional design, the visual information inherent in a product's form plays an important role in determining the product's aesthetic nature (Coates, 2003; Norman, 2004; Crozier, 1994). The more information a product embodies the more it has the ability to capture the consumer's attention and elicit feeling, passion and urges (Coates, 2003). So what are the ideal elements required for a

product in order to trigger the consumer's positive response? Design theorists and scholars Mayall (1968), Doczi, (1981), Papanek (1984) and Crozier (1994) note that humans have an innate preference for forms that follow natural and organic principles (Figure 6); they tend to prefer man-made objects that resemble organic forms.



Figure 7 Orgone lounge chair, designed by Marc Newson, 1989 (Design Museum, 2006)

For instance, Newson's Orgone lounge chair (Figure 7) has gained significant attention in the commercial market since it was put into production in 1992 (Design Museum, 2006). At first sight, the chair presents a diverse morphology of forms – almost human (anthropomorphic), animal (zoomorphic) or bug-like forms with non-geometrical legs. The curved forms on the back and seat mimic the human body, which promises the ergonomic comfort of the chair. On the other hand, viewing the chair engaged viewers in the process of personification as they discussed the physical features of the chair in human terms such as cute, sexy, nutty, muscular and so on; that is, the viewer's emotional response to the style of the chair. This shows that a conventional geometrical chair can be softened with a curvilinear line that is more organic in form so as to be aesthetically pleasing and naturally preferred by people.

The form of the Orgone chair appears to be balanced and symmetrical. People are attracted to forms that appear balanced. They inherently find a delight in objects with symmetrical, unified harmonics with rhythmic forms that involve repetition of similar design elements (Papanek, 1984; Crozier, 1994; Bloch, 1995). The sweeping curves of the chair mimic the human body and suggest a dynamic energy. This is similar to streamlined designs such as an airplane's aerodynamic form, which mimics the form of birds (zoomorphic). Streamlining has become a basic styling feature for many product designs, for example today's computer, electrical appliances and cars that symbolise speed (Woodham, 2004).

The organic design elements, such as curvilinearity, symmetry, unity, harmony, rhythm, balance and streamlining, appear to have been derived from the golden section. According to design theorists Mayall (1968), Doczi (1981), Papanek (1984) and Crozier (1994) products designed with the golden section proportion (length:width = 1:0.618) give a uniquely attractive proportion (Doczi, 1981) and sense of beauty. The elements mentioned are significant design preferences that humans seem to naturally prefer, perhaps due to the prevalence these forms in nature. Besides the human preference for natural forms, people's taste and preference for particular product forms are also influenced by cultural, social and consumer characteristics and by situational factors (Bloch, 1995).

Nature provides a source for the designer in creating emotional forms. Therefore, to design a display system that consumers prefer, these principle sources of beauty are included in the design criteria.

2.7.2 Memphis Style Influence

Design reflects social, cultural and technological change, and the complexities and contradictions of contemporary life (Watson, 2005). The growing number of consumer demands for products endowed with cultural and aesthetic status stimulates furniture design that has evolved from traditional forms that served merely as functional tools to the iconic products of today (Woodham, 2004). Many innovative shelving units were created throughout the twentieth century with the purpose of improving the quality of life (Sembach, 1997). As part of social concern, having concern for peoples' emotional wellbeing leads to improvements in their quality of life (Quality of Life Research Team, 2004).

Conversely, in 1919, an art and technology movement that flowed from the *Bauhaus* created product forms which rose from functional and economic necessities and were shaped by the action of machines rather than by the hands of artisans (Coates, 2003). The Bauhaus movement embraced the adages *form follows function* and *less is more*, resulting in the creation of product forms that were described as rational and lacking in emotion (Coates, 2003). For decades the preoccupation of Bauhaus' designers and manufacturers endowed consumers with less exciting products.

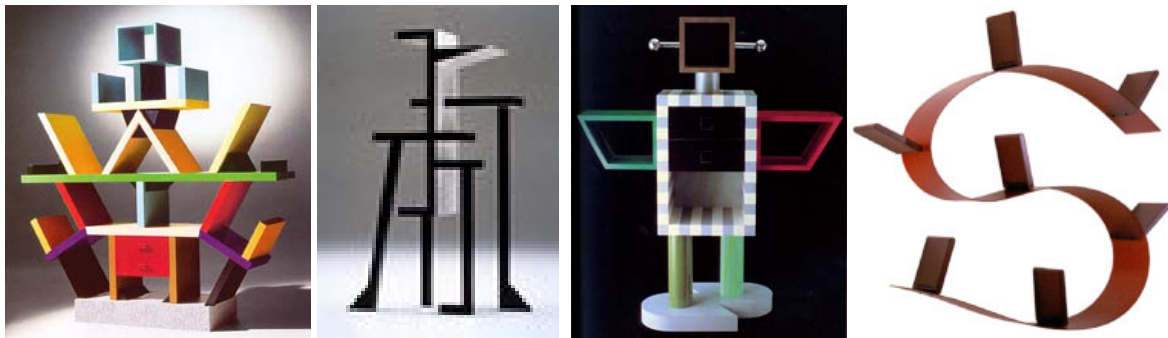


Figure 8 Shelving designs that derive from the fun and humorous characteristics of Memphis
(Left to right) Carlton sideBoard by Ettore Sottsass, 1981 (Radice, 1985)
Kotobuki (Celebration) shelving by Sinya Okayama, 1989 (Abentroth et al., 1999)
Memphis Ginza shelf by Masanori Umeda, 1991 (Dietz, 1992)
Bookworm wall shelving by Ron Arad, 1994 (Sudjic, 2001)

However the emergence of Memphis design in 1981 turned the design world upside-down. Memphis design seriously challenged the post-Bauhaus *black box* designs of the '70s. These designs appeared bare, humourless and soulless, and have less ability to convey information and appeal to our senses. Memphis, the *New International Style*, was described as the most groundbreaking and fascinating phenomenon in the field of furniture and object design at the time (Radice, 1985; Design Technology Department, 2003).

Memphis was founded by a group of avant-garde international designers⁵ in Milan in 1981 (Radice, 1985; Woodham, 2004; Watson, 2005). The group was led by Ettore Sottsass, who was described as a forward-looking and mischievous designer. This is because Sottsass's works are often colourful and humorous in contrast to the black and modern design of the '80s. Sottsass, as one of the key figures of Studio Alchimia⁶ had left to form Memphis due to the differences of opinions with Allesandro Mendini (Woodham, 2004). Memphis explored the creative potential of design as a powerful agent for change in contemporary manufacturing norms (Woodham, 2004). The Memphis group positioned itself as a fad rather than a movement. It is a *disappearing design* as implied by Sottsass (Watson, 2005).

The main aim of Memphis was to revive the Radical Design⁷ movement that was closely associated with the Anti-Design⁸ movement. Both movements emerged in Italy in the 1960s. Memphis shared the same principles with both movements and firmly opposed "Good Design"⁹, a movement that opposed superfluous styling as a marketing tool. Radical Design and Anti-Design movements sought to harness the social and cultural potential inherent in the design process and explore the rich potential of colour, ornament and decoration. For Memphis, decoration and styling were a fun approach, like a game (Roper, 2000). The Memphis style drew inspiration from sources as diverse as Art Deco¹⁰, Pop¹¹ and Kitsch¹². These movements considered the expressive potential of visual irony and distortion of scale in design; these have become important features of Memphis design (Radice, 1985; Woodham, 2004; Watson, 2005).

These influential movements led Memphis to explore new possibilities by using bright colours and extremely decorative features combined with patterns and textures. These included the striking juxtaposition of cheap and expensive materials and finishes to create the stylistic excessive look of product design (Radice, 1985; Woodham, 2004; Watson, 2005). Memphis also explored meaning and metaphor in furniture and product design that was directly opposed to conventional and minimalist modernist product designs (Woodham, 2004).

⁵ These designers included Andrea Branzi, Michele De Lucchi, Nathalie Du Pasquier, Michael Graves, Hans Hollein, Arata Isozaki, Issey Miyake, Peter Shire, George Sowden, Javier Mariscal and Metteo Thun.

⁶ Studio Alchimia was established by Allesandro Mendini in 1976. It was a Milan-based avant-garde experimental design group that worked outside the constraints of mass-production and dictates of manufacturers and strongly opposed to the dogma of elegance and good taste that was associated with modernism. Studio Alchimia is evolving from the "Anti-Design" experimentation of two Italian Radical Design groups of the 1960s, Archizoom and Superstudio (Woodham, 2004).

⁷ Radical Design concerns social and cultural possibilities inherent in the design process. It strongly opposed the constraints of capitalism. The role of the consumer-user was central to their thinking (Woodham, 2004).

⁸ The key exponent of the Anti-Design movement is Ettore Sottsass, and it was led by radical design groups Archizoom and Superstudio, who embraced the ephemerality of pop, consumerism and the language of mass media (Woodham, 2004).

⁹ Good Design emphasis is on pure form rather than decoration, a restrained palette and appropriate use of materials (Woodham, 2004).

¹⁰ Art Deco is a term widely used from the 1910s, 1920s and 1930s. The style is characterised by bright colours, geometric shapes and decorative motifs derived from a wide range of visual sources, from botanical to zoological forms (Woodham, 2004).

¹¹ Pop emerged in the mid-1950s with reference to popular culture. Pop caters to affluent younger consumers. The Pop movement seriously undermined the aesthetic characteristic of modernism and also opposed the official notion of Good Design. Pop was influential in terms of its iconoclastic outlook in relation to style, materials and mode of manufacture. Pop impacted on the Anti-Design movement of the radical avant-garde in Northern Italy and Postmodernism in latter decades of the twentieth century (Woodham, 2004).

¹² Kitsch is a term explored by the American critic Clement Greenberg in an essay "Kitsch". Kitsch implied characteristics that indicate sentimentality, vulgarity and pretentiousness (Woodham, 2004).

Although the Memphis group was dismantled in 1988, many contemporary designers from diverse fields of design, including Carlo Alessi, Michael Graves, Ron Arad, Phillip Stack and Aldo Rossi, were deeply influenced by these new visions and designs. They innovatively express Memphis ideas in many of their works.

In furniture design Memphis counteracted mainstream Modernism. It was inclined to be more subjective, craft-oriented, conceptual, artistic and new elitist (Radice, 1985; Woodham, 2004; Watson, 2005). Memphis design influenced contemporary furniture design to be metaphorical, amusing and to include symbolic characteristics in order to meet the emotional needs of consumers.

The stylistic, amusing characteristics and unconventional features of Memphis designs inspired the study to take a particular direction. The emotive, fun and sensuous sculptural forms of Memphis design are incorporated in this design development to create a new display system.

2.7.3 Casual Field Observation

In the study, existing domestic display systems in the market are analysed and compared in order to improve the design value of a display system and to ensure it will satisfy the emotional needs of the target consumers. Nine renowned display systems that are specifically designed for the contemporary domestic space are documented; these include local and overseas designer shelves. The aim is to gain understanding of what emotional design aspects are suitable for the development of the display shelving in response to peoples' wants and current design trends.

Existing shelves are analysed, based on their visual, aesthetic and physical properties, interaction characteristics, and elements that may provide pleasure to the consumer. These strengths and values are applied in a display system design.

Figure 9 shows the selected New Zealand display shelving designs in the market.

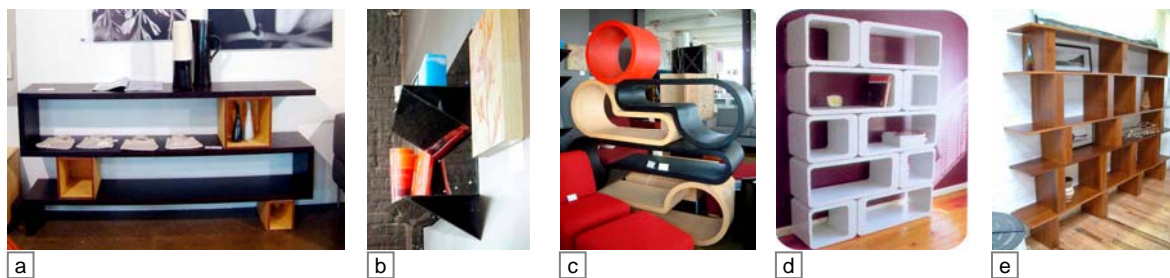


Figure 9 New Zealand shelving designs
 a S-shaped shelves by Robert Husloff 2002 (snapshot at Eon Design, 2003)
 b Wall shelves by Katy Wallace (snapshot at Eon Design, 2003)
 c Koru shelves by Kim Martinengo (snapshot at Eon Design, 2003)
 d "Substances" shelves by Rinaldo Baker 2003 (Baker, 2003)
 e Modular Shelves by Kathleen Haines (snapshot at Uno Design, 2003)

Figure 10 shows the selected overseas display shelving designs in the market.

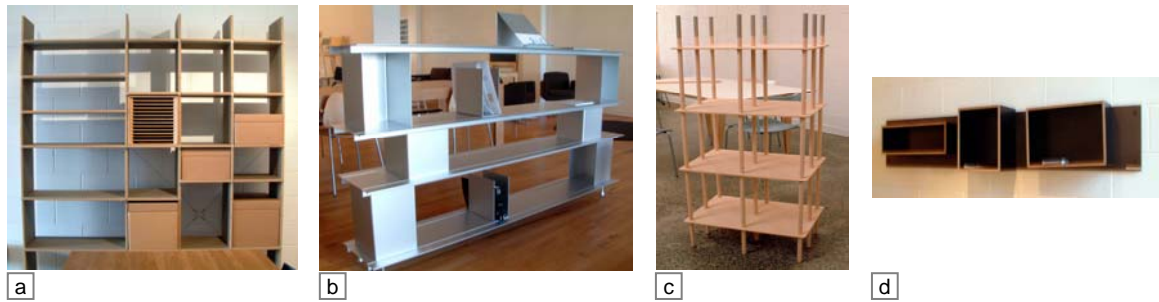


Figure 10 Overseas shelving designs in the New Zealand market

- a FNP Shelves by Axel Kufus 1989 (Snapshot at Katalog, 2003)
- b Zoll D Sideboard by Lukas Buol & Marco Zund 1993 (Snapshot at Katalog, 2003)
- c ES Flaccid Shelf by Konstantin Grcic 1999 (Snapshot at Katalog, 2003)
- d Magnetique Shelves by Swem Krause 2000 (Snapshot at Katalog, 2003)

There are some shelves that look more like objects of art than functional shelves. They have more emotional appeal, and are attractive and visually pleasing. These include the Koru shelves (Figure 9c) with their natural organic forms that mimic the fern leaf scoll and use a combination of contrast colours on the modular units. The “Substances” shelves (Figure 9d) appear playful, with their smooth, stylish rounded edges and different thickness of frame profile at one side. Both shelves (Figure 9, c and d) provide an entertaining experience, with modular and portable sizing that allows flexible configuration to accommodate different sized spaces. The ES Flaccid shelf (Figure 10c) is a fun and interesting shelf that is mischievously designed with multiple legs to test the boundaries of stability with a design that wobbles yet doesn’t fall over. Shelving systems designed with these values are fun, playful and visually pleasing. They can draw more attention and evoke aesthetic impressions from consumers. These elements are adopted in the development of the proposed display system.

The shelving systems (Figures 9 and 10) are manufactured in various materials. such as plywood (Figures 9a, 9c and 10d), solid timber (Figures 9e and 10c). MDF boards (Medium Density Fibre) (Figures 9d & 10a), aluminum (Figure 10b) and acrylic plastic (Figure 9b). The smooth texture, shining surface and thermal sensation provided by those materials are very interesting and possibly provide the user with different tactile sensations. The material weights of some shelves are reasonable and necessary for a stable configuration. Materials are important factors to consider, both for function and aesthetics in shelving design. For the design of the display system, a detailed selection of materials for prototyping is discussed in Chapter 4.

2.7.4 Casual Design Conversation

Along with the casual field observation, a brief design conversation about existing display units was carried out with a few designers, Eaton (2003), Greenwood (2003), James (2003), Baker (2003), and with retailers Behke (2003) and Barr (2003). The discussion issues focused on design aspects and consumer preferences in display shelving. These conversations provided opportunities to learn from the experiences of experts in designing a desirable shelving system.

From the conversations the following significant points were identified. The majority of the designers and retailers shared the same views:

- Shelving design should be simple in form and function.
- Shelving design that can be changed and adapted to different uses is often preferable. The benefits of flexible shelving design include shelving that can be rearranged to suit different spatial configurations that are made up of smaller units and can be mixed up.
- Shelving that is portable and can be moved easily is also preferable.
- Shelving designs that have unique and individual characteristics tend to be preferred by consumers. They will pay more for something that is different.
- Design shelving for today's domestic environment should use new or novel materials rather than conventional shelving materials to make the shelving more attractive and appealing.

These suggest that a display system that is attractive, simple, flexible and adaptable, useful and usable, and unique is more desirable to consumers.

Chapter 3

Research Methodology



Figure 1 Basic elements and stages of design methodology (Swann, 2002)

Design methods were first established by design theorists¹ from the engineering field to assist industrial designers in the process of designing products and solving design problems from a scientific viewpoint (Swann, 2002; Roth, 1999). Nigel Cross (2001) defined design methodology as a science of design that attempts to improve designers' understanding of design through systematic and reliable *scientific* methods of investigation (Cross, 2001). Many design methodologies (Archer's models, 1984; Jones's model, 1984; Pahl and Beitz's model, 1984; the VDI 2221 model, 1984; March's model, 1984) have been proposed in recent years and reviewed in Cross's work (1984, 2000). The basic structures for a systematic design methodology, for which a consensus view is held by design theorists, are outlined in Figure 1 above.

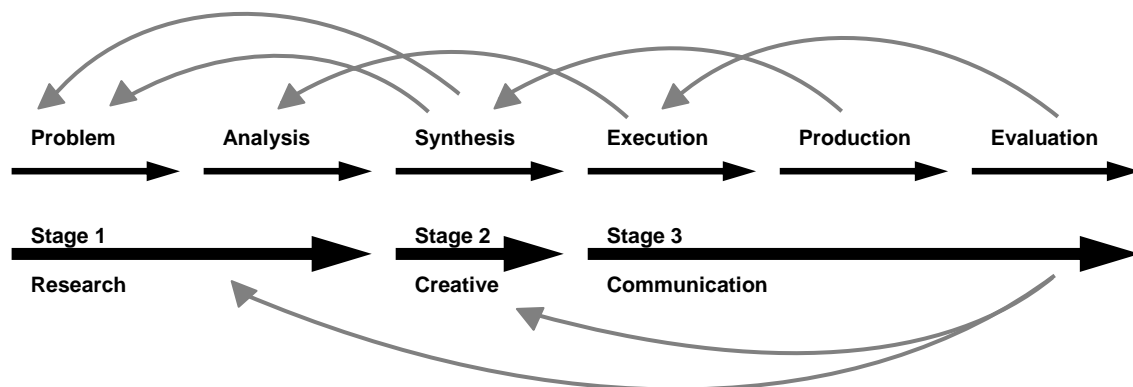


Figure 2 Swan's three-stage summary model for action, research, methodology. The feedback loops show the process is iterative (Swann, 2002)

However the rise of new products in the marketplace to accommodate the needs and wants of new consumers from different backgrounds and cultural experiences has indicated a need for a change in product design processes and manufacturing activities. As shown in Figure 2, Swann (2002) has developed a compatible methodology for approaching both the design process and action research.² It reveals the need to establish and apply an appropriate paradigm for the study (Swann, 2002) and develop this intellectual awareness within the design community as suggested by Cross (1999).

¹ The earliest design theorists are Jones, J. C., Archer, L. B., Alexander, C., Luckman, J., Asimov, M. & Cross, N. (Developments in Design Methodology. pp. 1–83.)

² Action research is research in which the process of making or designing an artifact constitutes the methodology. Seago, A. and Dunne, A. (1999). "New Methodology in Art and Design Research: The Object as Discourse." *Design Issues* 15(2): pp.11–17.

3.1 An Integrative Model

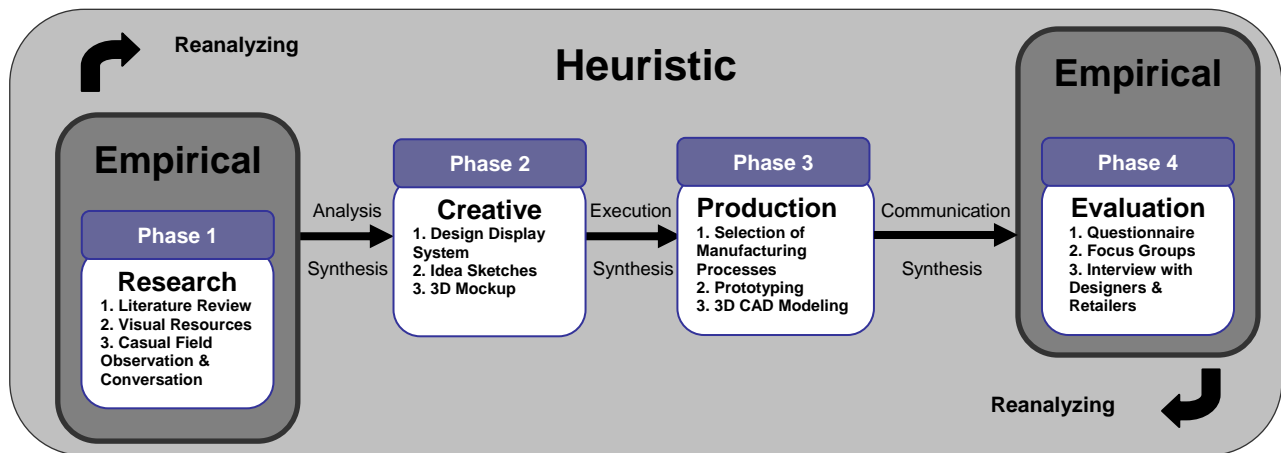


Figure 3 The four-phase design research method for designing a new display system

Design strategy keeps designers aware of their direction and ensures that their methodology remains realistic with respect to the constraints of time and resources (Cross, 2000). In the study both empirical and heuristic design strategies are combined to arrive at the best outcome, which is heuristic for ideation while empirical for data collection and evaluation. The essential elements from both frameworks (Figures 1 and 2) are incorporated into a four-phase design research methodology (Figure 3) to accommodate design processes in this study. This takes into consideration the sequence of design activities that is expected to be carried through the conceptual design development of the display system.

3.2 Heuristic Method

A heuristic method is employed throughout all phases of the study. The heuristic approach may be regarded as an intuitive process that can be accessed in any order in the design process. This process relates to Fletcher's model: **Search – Discovery – Recognition and Evaluation** for all phases (Swann, 2002). Cross (2000) describes the heuristic process as:

using previous experience, general guidelines and rules of thumb that lead in what designers hope to be the right direction, but with no absolute guarantee of success (Cross, 2000, p. 29).

This suggests that this strategy should allow for flexibility for designers to change their original objectives toward a creative resolution of a design problem as a project evolves. The heuristic process has been selected as the right method to approach the possibility of design findings, design decision-making, and in order to elicit solutions through experimentation and experience in the evaluation process. The heuristic principle involves an iterative process of constant revisiting or reanalysing of the design problem and synthesising revised solutions simultaneously among the project phases.

3.3 Empirical Methods

Empirical research requires that all theories and knowledge should be based on experience and observation rather than on intuition or pure logic (Soanes, 2001). Empirical research methods consist of quantitative and qualitative research methods. The quantitative research methods collect numerical data and analyse it using statistical methods, for example questionnaires. The qualitative research methods collect qualitative data (in the form of texts, images and sounds) drawn from observations, interviews and documentary evidence. These are analysed with qualitative data analysis methods (Moody, 2002), and can lead to a more comprehensive understanding of an event (Moody, 2002).

In this study the empirical methods are employed in the earlier research phase and the evaluation phase. In the research phase the qualitative research methods, such as reviewing existing literature and visual resources, and casual field observation and personal conversation, are used to inform design direction. In the evaluation phase combinations of quantitative and qualitative research methods are used. These include questionnaires, focus groups and interviews. The triangulation method allows evaluation of design concepts and understanding of potential users and their design preferences. The combination of implementing the quantitative and qualitative approaches help to verify the designer's findings and assumptions.

3.4 Review of Existing Literature and Resources

A review of existing literature and visual resources helps to inform and update in terms of what is current in the field. It addresses the knowledge and ideas that have been established within a topic by scholars and researchers, and what their strengths and weaknesses are. The comprehensive information provides a solid background to inform and contextualise the practical work. This also gives an insight into the current issues of designing emotional and pleasing products to fulfill the fantasies of today's consumers. The resources that were consulted in order to understand and investigate the research topic included books, journal articles, electronic sources and audiovisual materials.

3.5 Casual Field Observation and Conversation

Casual field observations focus on in-depth observation and comparison between specific existing display systems that are already in the furniture market. The information gained from the analysis of existing designs helps increase understanding and awareness of current design trends and consumers' emotional needs in display shelving. The observations in the study include those of display systems from local sources and overseas. The study addresses design characteristics, functionality and material usage.

Along with the field observation, personal conversations were carried out with experienced designers and retailers. The conversations focussed on the design aspects that help to further substantiate findings from field observations. The significant information gained from the conversations provides the designer with more objective and qualitative data for analysis and development of the design.

3.6 Survey Questionnaires

A survey questionnaire is a quantitative instrument frequently used in combination with qualitative methods to verify research findings. This method measures which assumptions formed from a small sample can be generalised to a larger population (Stricker, 1999).

In the study, the questionnaire is designed to gather data to understand participant's preferences for aesthetic aspects of display shelving. Questionnaires can also generate a large amount of valuable information to inform the design of a new display system.

The questionnaire is pre-tested for reliability with 10 participants before the survey is carried out. Pre-testing survey drafts ensure that questions do not confuse participants or influence choices, and ensures all necessary categories for choices are provided (Stricker, 1999).

A simple survey questionnaire involving 80 participants evaluates the aesthetic qualities of the display system and generates a better understanding of consumers' aesthetic responses.

3.7 Focus Groups



Figure 1 Focus groups

Focus groups are conducted to ascertain design appropriateness, usability, manufacturing qualities, preference and participants' aesthetic responses toward prototypes. In the focus group discussion, people tend to be more willing to divulge personal thoughts within the security of a group of strangers than in a one-to-one interview (Stricker, 1999). The interaction provides an opportunity to observe the process of attitude formation (Stricker, 1999). Furthermore, the dynamics of a group discussion may help stimulate ideas from other participants through issues raised by one participant (Jordan, 2000). The group discussion method provides some significant opinions and ideas to improve the design of the display system.

Two focus groups of eight participants each were carried out separately in a meeting room at the AUT library. The first few minutes of the discussion were spent in explaining the information sheet

and consent form. In order to break the ice among the participants at the first meeting, each participant was asked to introduce themselves to the group. After that, there was a brief discussion of the prototypes. Participants were then asked to make observations on the prototypes displayed in front of them and to proceed with touching, lifting, stacking and playing with the prototypes. Participants were encouraged to discuss the topic freely among themselves and to raise relevant issues. Their interaction with the prototypes was photographed and the group interviews were audio taped to eliminate any bias caused by selective memory (Taylor and Bogdan, 1998). Each group spent about 45 minutes in the discussion. At the end of the session, participants were thanked for their time and commitment, and a \$10 petrol voucher was offered to each participant.

3.8 Interviews

Interviews were conducted with two professional designers and two furniture retailers to solicit their expert opinions on aesthetic preferences, design appropriateness, manufacturing qualities, design solutions and the emotional aspects of the display system. The interviews were conducted as unstructured interviews (Taylor and Bogdan, 1998); respondents were asked a series of open-ended questions. This gave respondents the chance to steer the discussion toward the issues they regarded as important. The advantage of the open-ended interview is that respondents can ask for clarification if there is any ambiguity in the wording of a question during the interview. The investigator can also prompt to the respondent if the answer given is interesting. The interactive nature of the interview helps to gather more valid data to inform the display design.

Interviews were conducted face-to-face with the interviewees. This provides an important balance to focus groups (Stricker, 1999). During the interview, participants were encouraged to address issues and talk freely about their expertise and understanding in relation to the questions.

The survey questionnaires, focus groups and interviews have generated valuable information to inform a new series of shelving system designs. The primary information is combined with secondary information from published sources to design a shelving system that is both functional and emotional for users.

Chapter 4

Conceptual Design Development

Archer (1984) suggests that the creative phase is at the heart of the design process. It requires involvement, subjective judgement and deductive reasoning (Swann, 2002; Cross, 2000). Since design is a *human solution* (Norman, 2004), the designer is responsible for solving problems. In the study, the creative phase involves the application of *solution-focus* (Cross, 2000) strategies to solve ill-defined problems (design problems) and synthesise numerous factors that lead to a solution. The synthesis stage is highly personal and subjective, but reflecting and recording the design process through the analysis of case studies may provide evidence and opportunities for future refinement (Swann, 2002). In this study the design activities utilise the process of design evaluation, idea generation, exploration and definition, and understanding the design problem to find potential solutions.

A designer is often seen as a sole practitioner, who self-analyses and evaluates their own work (Swann, 2002). A collaborative or team approach is applied to this design project. The approach includes interaction with the creative field outside the designer's experience by gaining input from design professionals or other sources of information. These are applied to ensure success in the application of the design objectives.

4.1 Design Criteria

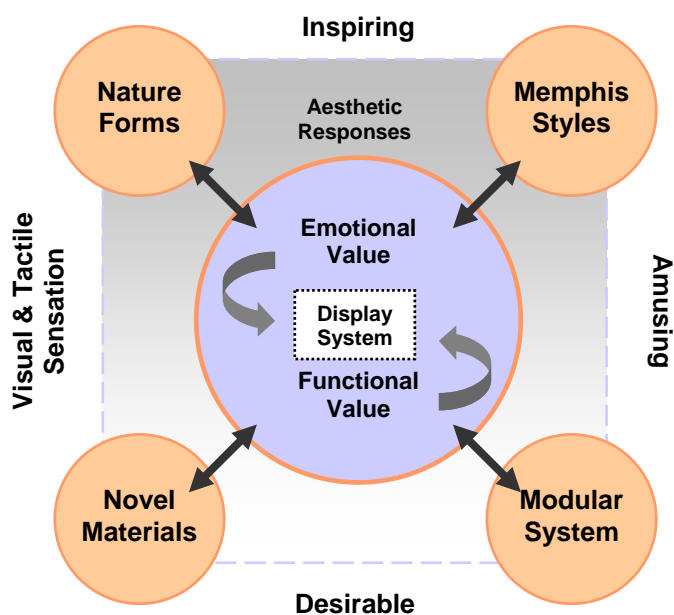


Figure 1 Design criteria

The aim of this project is to design a display system with emotional and functional qualities. Consumers are given the impression that they own a display system that provides them with joy. The emotional and functional values infused in the display system help to create these aesthetic impressions, such as being amusing (playful or fun), inspiring (interesting or attractive) and desirable (worth having). To capture these values, four essential elements are incorporated to create emotional and functional value. Nature forms, modularity, application of

novel materials and Memphis styles (Figure 1).

Based on the literature, these elements are believed to play a significant role in determining consumers' aesthetic responses. In the project, the possibilities of instilling these emotional values into the design are explored. Implementation of organic sculptural forms, patterns and colours inspired by nature and adapted to a modular structure are incorporated into the display system. These attributes make it more ergonomically flexible and functionally usable, with a reasonable size and weight. The use of novel materials, a mixture of cheap and expensive materials and materials with different textures create a fun and stylistic look to achieve the unconventional yet usable style of Memphis design (Radice, 1985; Woodham, 2004; Watson, 2005).

The design is assessed by potential consumers to measure their response and preferences. The aesthetic responses this project looked are amusing, inspiring, desirable and their visual and tactile sensations through the physical properties of the design.

4.2 Design Explorations

As alluded to earlier, heuristic design methods are employed throughout the design process. Sketches are used to explore and express the aesthetic essence of a design not its objective reality. The use of sketching to facilitate the idea-generation process is still actively applied by design professionals today (Goldschmidt, 2003). Sketches are an extension of mental imagery or *visual thinking* (Arnheim, 2004). Previously stored images are retrieved and to manipulated rapidly (Goldschmidt, 2003). Sketching is also used to test ideas, to experiment, to revise and to look for alternatives. Sketching is a search process and an aid to thinking (Goldschmidt, 2003).

In the design process, design ideas are produced based on the design criteria specified in section 4.1. The criteria provide guidelines for the design process during ideation.

4.2.1 Ideas Generation – Nature Forms

Throughout the exploration of the design, Memphis design characteristics are considered alongside three elements (nature forms, modular system and novel materials) to ensure emotional and functional values in the design are captured.

In the design activity of sketching, a straight-forward approach is applied to generate design ideas. This strategy provides a guide to control the idea generation to produce the intended result. The beautiful spiral structure of a nautilus shell is used as a source of inspiration, transforming it into a new design. The sketches (Figure 2) show the exploration of ideas, transforming the natural elements into emotional values.

The first attempt did not meet the design requirements adequate to a modular and portable display system. Modular forms have a wider range of possibility for creative configuration and have the ability to be transformed into different arrangements. This offers the consumer a sense of enjoyment, such as playfulness and fun, and a sense of control when manipulating the modular shelves.

Although the modularity concept was adopted in the next attempt, sketches have become a fundamental conceptual guideline for further exploration into the emotional value in the portrayal of natural forms. The forms have a simpler structure when applied to the shelving.

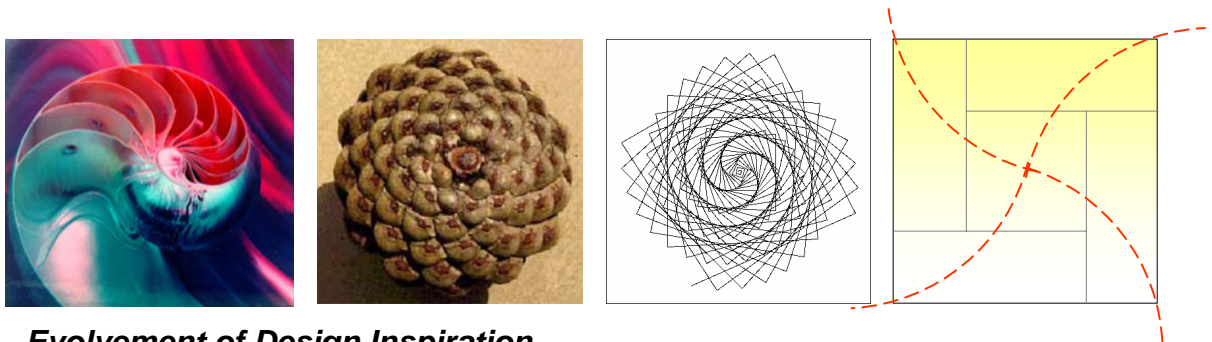


Design Inspiration



Figure 2 Exploration of natural forms

In this section the spiral form of the nautilus is explored, and looked at, as well, in combination with stacked modular forms found in nature, such as the pinecone, sunflower and succulents. According to the Fibonacci principle (Dozci, 1981), the spiral of the nautilus begins with a square. In the pinecone the spiral is formed with the intersection between the layers of squares. These are drivers for exploration into the notion of square and spiral in the creation of a stackable modular display system. A square is divided into five chambers that mimic the spiral form. The square is used to develop a series of modular display systems. Figure 3 details the process.



Evolution of Design Inspiration

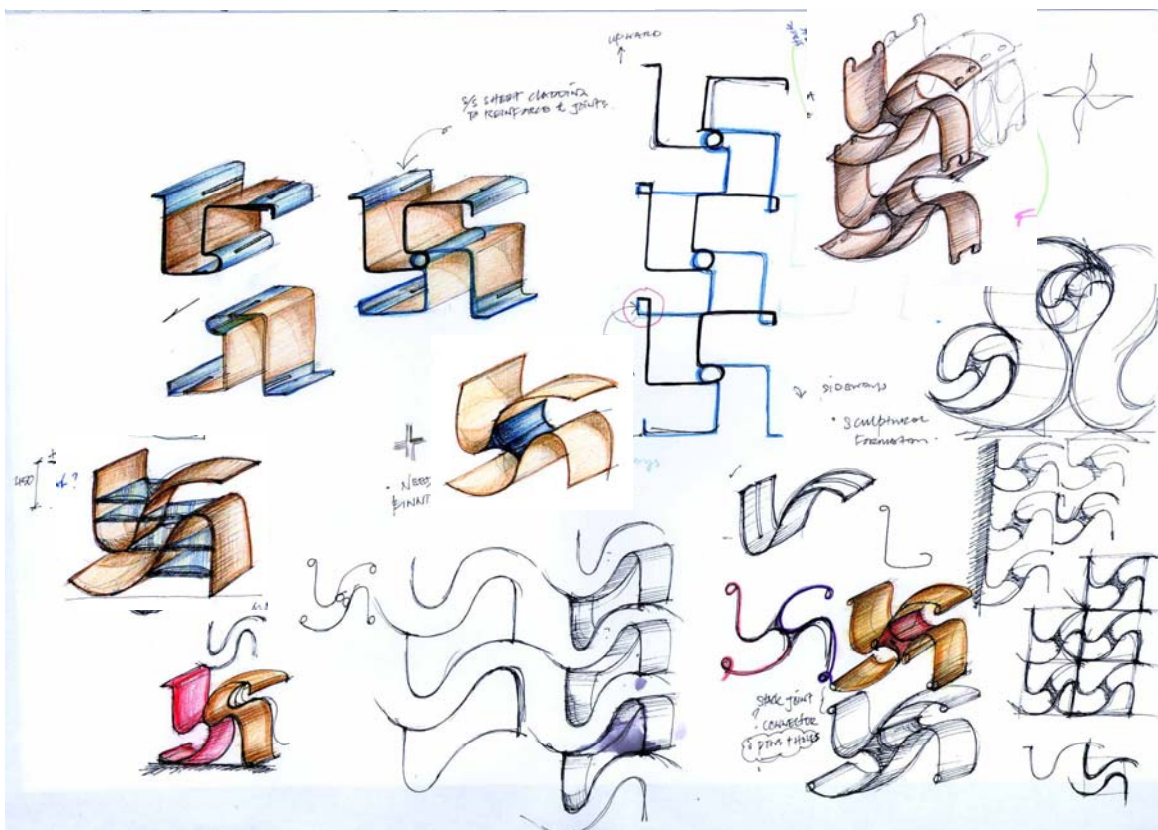


Figure 3 Exploration of modular structures

The modular structure is limited in its possible range of transformations. To overcome this, the decision was made to break the modular structure into four individual modules to allow other forms and spatial applications.

Figure 4 shows a modular shelf comprised of four units each joined to the other with some sort of flip hinge mechanism. This form allows for various configurations to suit different space

requirements. The ideal modular system may provide greater flexibility and be adaptable to smaller urban living spaces.

In further examination of the idea of transformation of form-modularity, the concept is tested to justify its feasibility. Two-dimensional sketches idea do not support that. Scaled-down cardboard models are made to test the design to see how it is able to be transformed into different forms and configurations

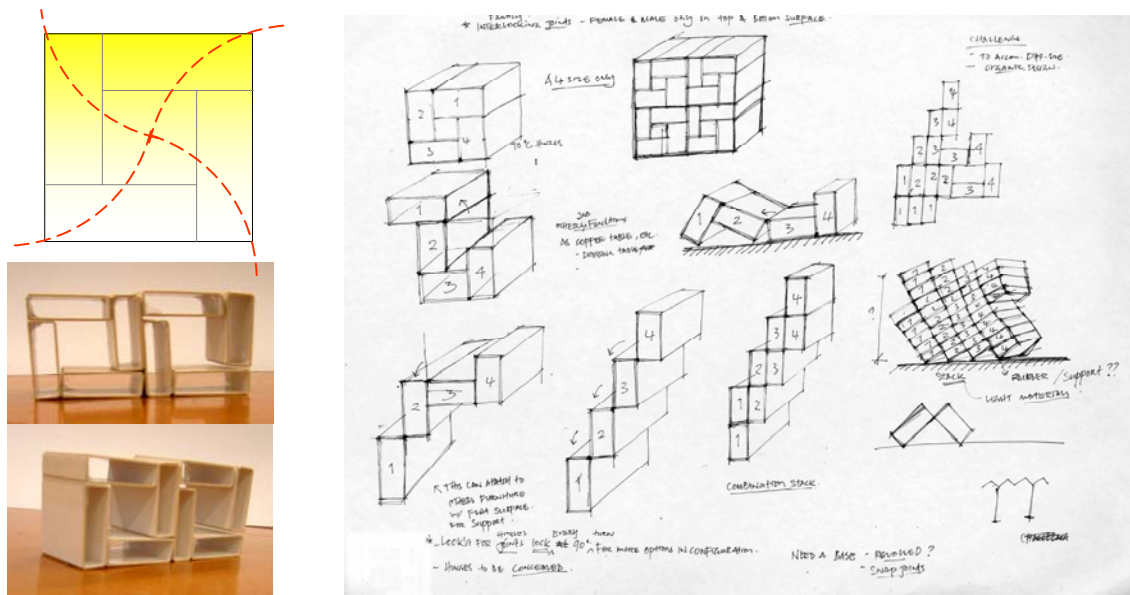


Figure 4 Testing the modular transformation



Figure 5 Experiment in free-form stacking with individual participants

Examination of the form through free-form stacking methods tests how much the modular structure can be transformed. An invitation is extended to ten peers and friends¹ to contribute their ideas to the study. The participants are asked to experiment with the scaled-down cardboard models as free-stacking modules in various forms, sizes, volumes and strengths without spatial limits. In the experiment, the participants' results produced different forms and styles. Seemingly, they treated the module structure as a sculpture rather than as a shelving unit. Some found restrictions in stacking the modules because of the rigid cube shape. Other stacked works revealed compactness, playfulness, innovation, decoration and sculptural appearance.

¹ Peers and friends who had contributed their effort in this research experiment are Karol Wilczynska, Stuart MacNab, Scott Gardiner, Jo Goile, D.K.Oh, Mark Pritchard, Andres, Marco Young, Linda Ai and Kob Poratshanee.

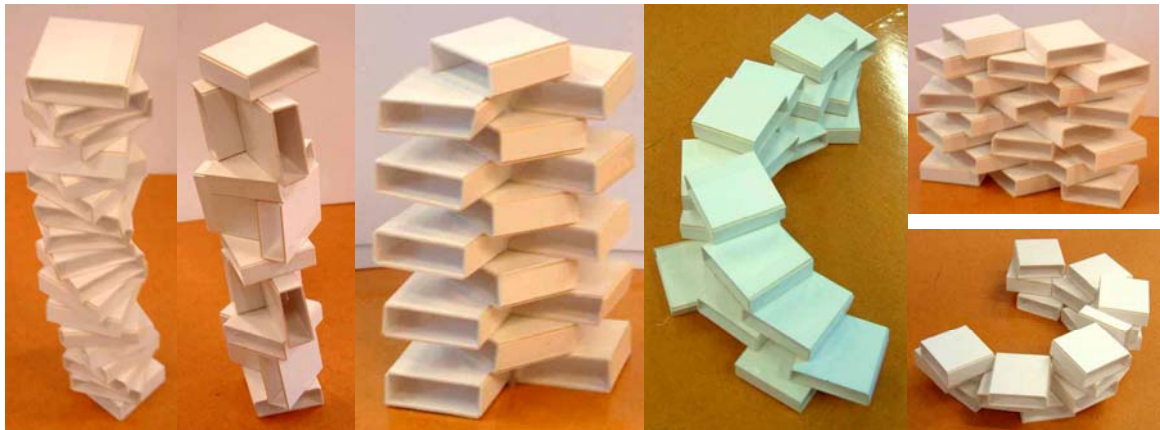


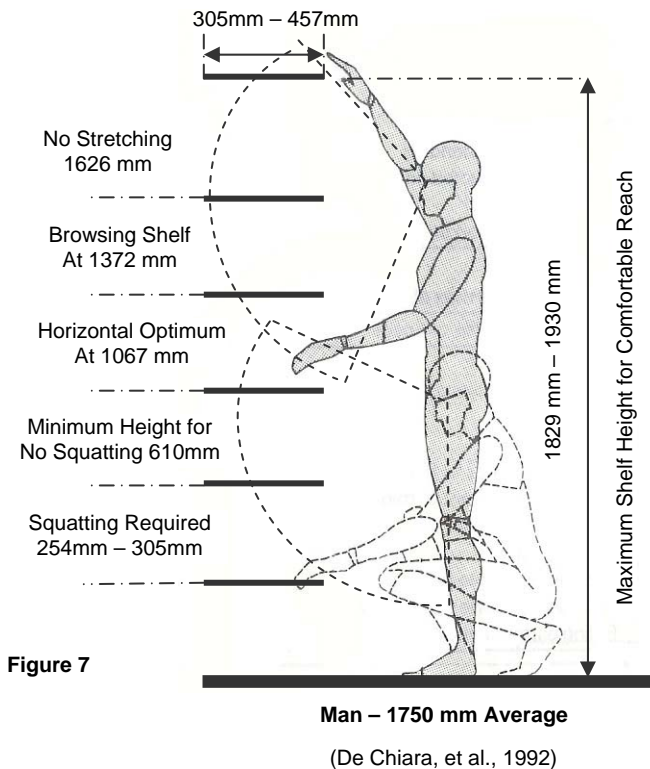
Figure 6 The series of mock-up stacks revealed organic appearance with irregular stacking methods

Based on these findings it has been determined that rigid geometrical shapes can be transformed into organic forms through free-form stacking methods and expansion. The participants seem to prefer mock-ups that resemble natural and organic forms and reinforce the view that human beings prefer forms that follow natural, organic principles (Mayall, 1968; Papanek, 1984).

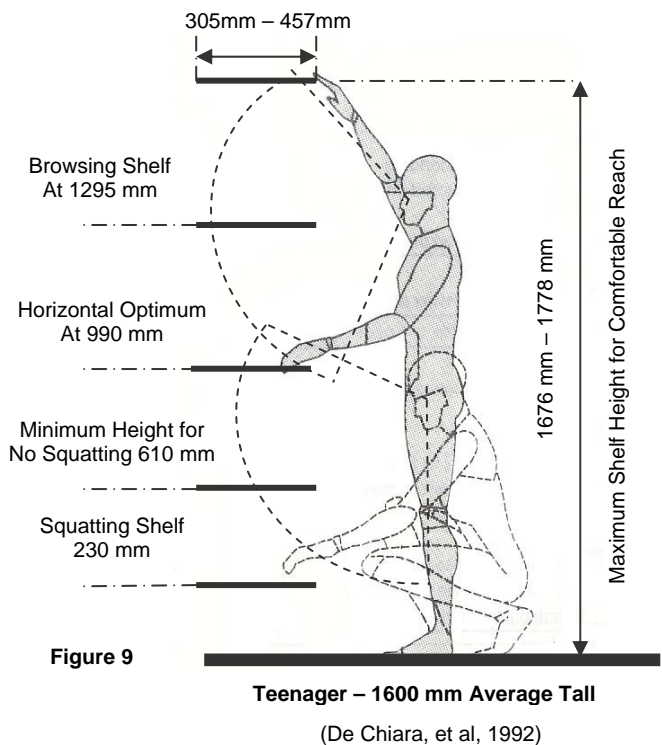
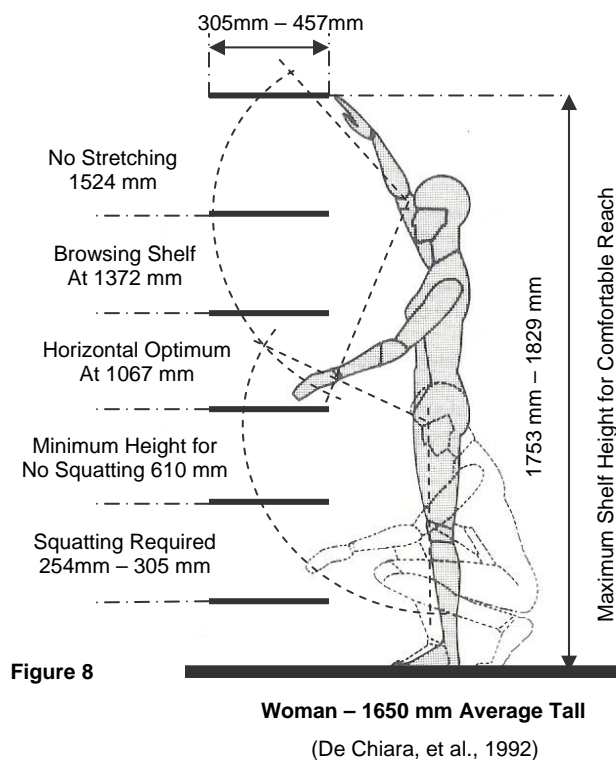
The flexible modular configurations provide a way to look at personal choices in manipulating shelving units and allows participants to customise the modular units according to their desires or emotional states. The experiments in creative modular stacking reflect how each participant may look for different configurations to reflect their individual style.

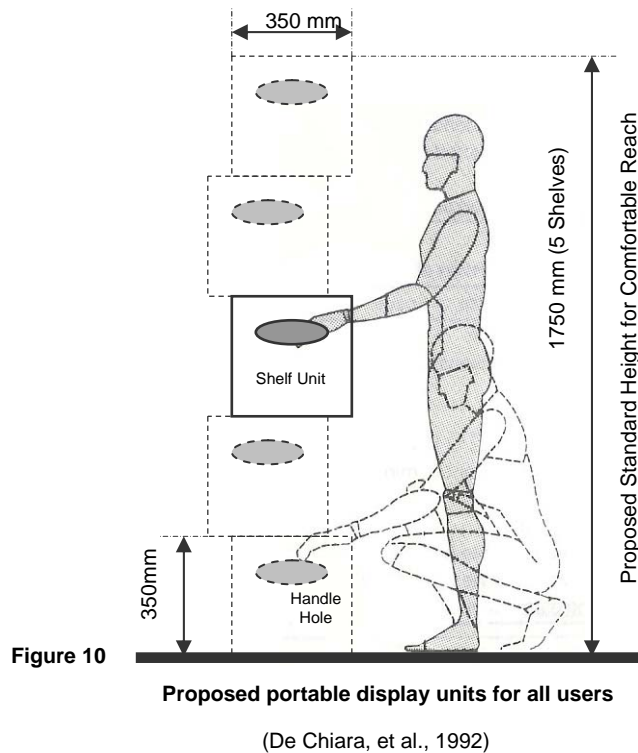
At this stage of the experiment the results show that every participant appears to be different. The flexible nature of the modular structures motivated the participants to explore new forms. From this we can say that two of the drivers of human learning are curiosity and play. The participants said they were satisfied and even delighted with the performance quality of the modular structures.

4.2.2.1 Ergonomic – Portable Size and Weight



The anthropometric data shown in Figures 7, 8 and 9 (modified and adapted from De Chiara et al., 1992), indicates that shelving needs to be designed to meet the access requirements for users. Due to human factors, such as physical, age and gender differences, precise formulae are difficult to develop (De Chiara, et al., 1992). However a standard design that offers flexibility in size and volume can be developed to suit all users.





The modular box-sized display shelf is designed to overcome the limitations, as showed in Figure 10 (modified and adapted from De Chiara et al., 1992). The advantage of adding on units provides for the flexible expansion of shelves when needed. The size of each unit is approximately (525 mm Length x 350 mm Width x 350 mm Height) to allow ease of portability. The space is considered wide enough for displaying and storing objects. Handle holes are included as part of the ergonomic design as well as decorative features. The weight of each unit is approximately 5 kg, the acceptable weight for adults and teenagers (De Chiara et al., 1992).

The design is portable, has acceptable weight, is durable and usable, and allows users to personalise the shelving structure to meet different spatial requirements. The selection of the right materials for fabrication plays a significant part in the design.

4.2.3 Ideas Generation – Novel Materials

In the context of designing a portable display system, materials used for fabrication of the shelving needs to provide a comfortable grip for the user. The design for tactile aesthetic pertains to the objective quality of a design, such as surface qualities, shape, size, colour and thermal capacity of the material. Different materials, that include rubber, plywood, metal and plastics, are investigated. The objective is to create a flexible, simple and unconventional display system that may engage the consumer through their sense of touch and lead the consumer to embrace the product.

A series of designs are produced with a simple and practical rectangular form. The use of rubber is introduced into the designs. Many rubber products have been reviewed, such as rubber rib mats, dimple mats and bathmats to evaluate design feasibility. Rubber suction cups are found to be funky and playful. The sticky surface provides stable connections between the display units. In addition, the surface quality of rubber provides tactile pleasure with its soft grip. The suction profiles seemingly mimic the natural organic form of octopus suction cups and some succulent plants.



Figure 11 Nature provides the inspiration for using suction cups as connectors
 (Left to right) Octopus suction cups (Hasenick, 2002)
 Succulent plant (Grimsaw, 2005)
 Rubber suction cups (snapshot at Skellerup)

The combination of rubber profiles and the simple rectangular form and wider flat surfaces of the unit have the potential to achieve multidirectional configurations and allow for endless individual arrangements. The suction power of the rubber cups is dependent on vacuum atmospheric and works only on non-porous surfaces (Lousich, 2003). Figure 12 shows the exploration of box shelves with different materials and forms.

DESIGN 1

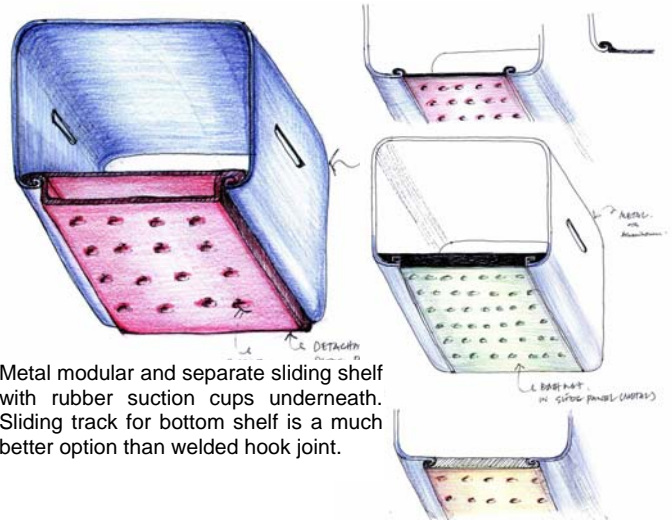
Rubber Suction Cups and Solid Rubber



Rubber bathmat with solid rubber backing.

DESIGN 2

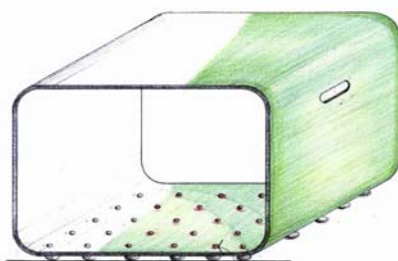
Rubber Suction Cups and Metal Sheet



Metal modular and separate sliding shelf with rubber suction cups underneath. Sliding track for bottom shelf is a much better option than welded hook joint.

DESIGN 3

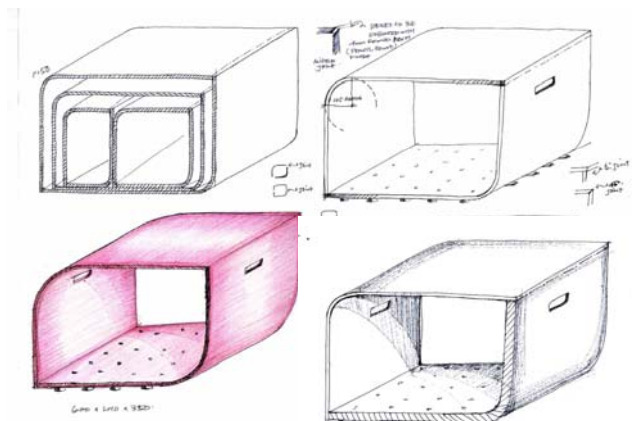
Rubber Suction Cups and Plywood



Plywood moulding with suction cups underneath. The PVC caps profile finished on the internal surface function as decorative and tactile features.

DESIGN 4

Rubber Suction Cups and Acrylic Sheets



Acrylic body complete with edge joints and large loop curves at opposite corners, this give a sense of double flow with endless directions.

Figure 12 Design exploration

In the search for the ideal material the form of the display shelves evolves to suit the different types of material and joining methods. However the form depicted in *Design 4* appears to be more interesting and dynamic. Its exposed joint lines have sharp edges to contrast with the large loop curves corners. This gives a sense of an endless spiral flow within the structure.

4.3 Investigation of Manufacturing Processes

During the design process it was difficult to judge whether the proposed designs were feasible without prototyping them at full scale and using the proposed materials. To choose the potential materials and manufacturing process, expert advice from the manufacturers (Matheson, 2003; Welsford-Ackroyd, 2003; Stevenson, 2003; Tarrant and Brind, 2003; O'Brien, 2003) is sought to gain know-how and to reduce the prototyping time-scale. Comparisons of the manufacturing processes help in understanding the potential of different materials and the impact on budget in order to achieve the desired results. Figures 13 to 16 show some of the manufacturing processes that have been studied.



Figure 13 Investigating Injection moulding process for cosmetic cap at Plastic Solutions, Glenfield

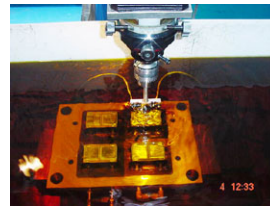


Figure 14 Investigating metal mould casting at O'Brein Plastics, Glenfield

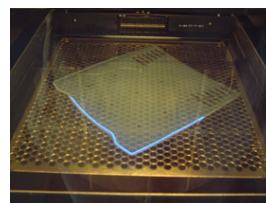
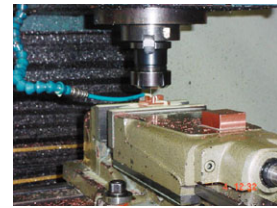


Figure 15 Investigating rapid prototyping at Plastic Design Technologies, Albany



Figure 16 Investigating plywood moulding process for cushion seat backing at Libra Woodwork, Onehunga

The manufacturing processes investigated included plastic injection moulding and metal mould casting, rapid prototyping, plywood moulding, metal work and acrylic sheet fabrication in some selected factories in Auckland. Among the processes, injection moulding for plastics and rubber and plywood moulding involve complicated engineering processes in the production of metal cast moulds² in early prototyping. This is not only expensive but also time consuming. The processes are only economical for mass production.

The process of rapid prototyping is not financially feasible, with the added constraints of technological production in a larger-scale prototype. Metal work requires extensive welding and traces of joins on surfaces are inevitable.

Metal may be a durable material but is sometimes noisy, which may cause sound pollution in the environment due to rough handling. Metal also requires constant repainting with powder coat finishes. Plywood can age rapidly under the worst weather conditions and is not recyclable due to the heavy use of glue in the plywood layers. Although material recycling is not the main issue in this study it is worthy of consideration.

In comparison, acrylic is favourable. Its clarity and shiny appearance provide an avant-garde look that blends into contemporary interiors, and, compared to metal, acrylic is warm to the touch. Acrylic fabrication is less expensive even if investing in a mould is required. Acrylic is easier to form into a complex shape and profile. It is practically unbreakable, and it is rust proof and deadens noise. Scratch marks on acrylic surfaces can be repaired with flame buffering. Acrylic is also cost effective because it requires fewer or no protective coatings, saving time and material. The lightweight material may help to save energy as it requires less fuel to manufacture and to transport and, most importantly, acrylic is safe through its resistance to impact (APME, 1997). Therefore acrylic³ sheet prototyping is chosen as the proposed material for the prototypes because of its versatility, strength and economy.

² A die mould is a metal mould used for duplicating products in large quantities. It is mainly used in the plastics manufacturing industries. The fabrication of a die mould involves tool and die making and requires precise dimensions. The tool and die makers perform some or all of the following duties:

A. Machine, fit and assemble parts to make metal moulds and cores for plastic injection moulding, or other production processes.

B. May program computer numerically controlled (CNC) machine tools to cut, turn, mill, plane, drill, bore, grind or otherwise shape work piece to prescribed dimensions and finish (APME, 1997).

³ *Acrylic* was first developed in the 1930s when its main use was in safety glazing for head gear. It is commonly known as *Perspex*, a trademark first registered in 1934. The combination of excellent clarity and light weight made it an exciting new plastic. The 1960s saw its applications spread into domestic environment through its use in contemporary furniture, where new applications were explored by avant-garde furniture designers. *Acrylic* is available in both cast and extruded sheet with each being particularly suited to different applications. Cast sheet is made between sheets of high quality glass and produced in batches. It has a very high molecular weight, making it strong resilient and easy to handle and fabricate. The cast method of manufacture is ideally suited to small colour runs and batch sizes. Extruded sheet has a lower molecular weight, making it easy to vacuum-form, and the extrusion process gives thickness tolerance and is economical for long production runs (Lefteri, 2001).

4.4 Prototyping

The following drawing shows the final description of a proposed display shelf prototype.

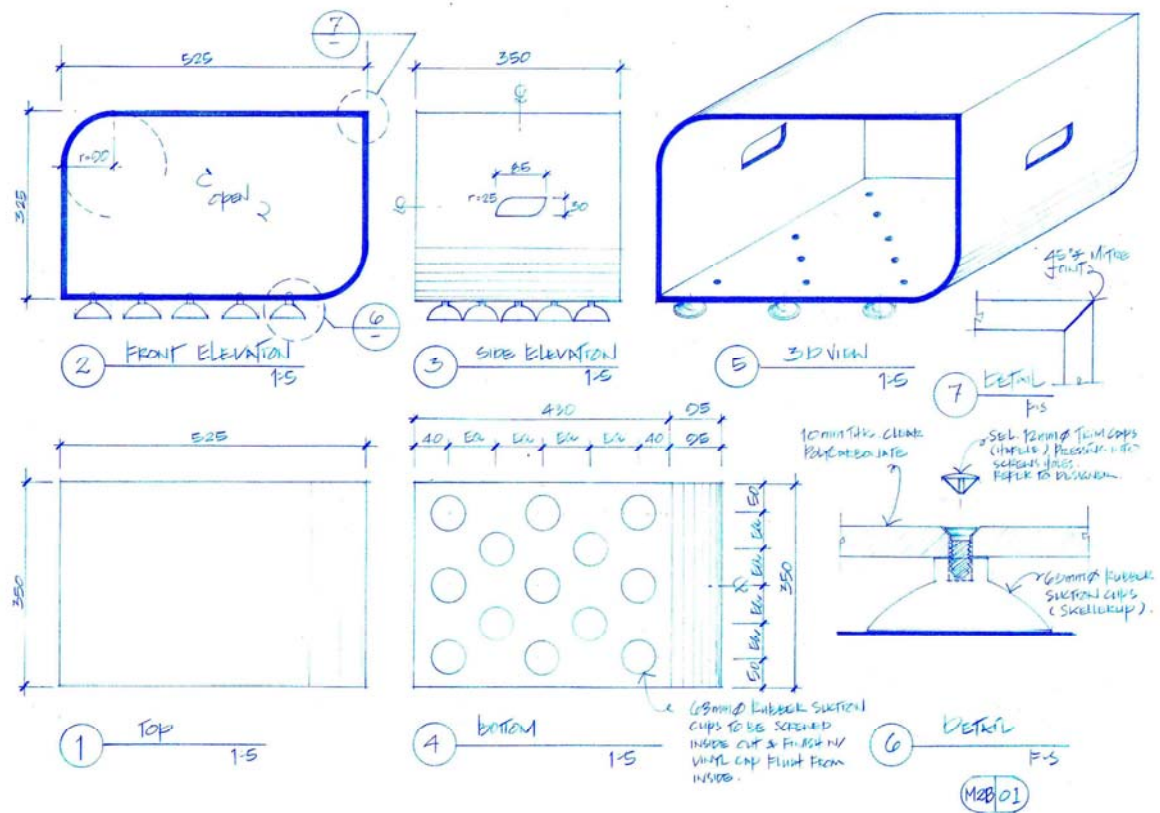


Figure 17 Detailed production drawing

The detailed drawing (Figure 17) is used as a form of communication (Cross, 2000) to manufacturers. The drawing provides detailed information of dimensions, materials, surface finishes and colour. It also contains precise instructions on how the prototype is to be made to avoid misunderstanding.

Requests for quotations were sent out to potential manufacturers before moving on to the prototyping process. The potential manufacturers were selected based on their interests and availability of technologies in manufacturing the prototype. The working drawing was then sent out for cost quotes.

During the quoting process, design adjustments were made as compromises to suit the requirements of individual manufacturers. The work was awarded to the manufacturer who produced a reasonably priced quote after comparing the prices among the manufacturers and their commitments to meet deadline.

In the prototyping process it is essential that the manufacturing processes are inspected, because this is where problems occur, and a professional manufacturer is able to share his knowledge and offer suggestions for solutions.

The following show the processes and equipment used to fabricate the prototypes.

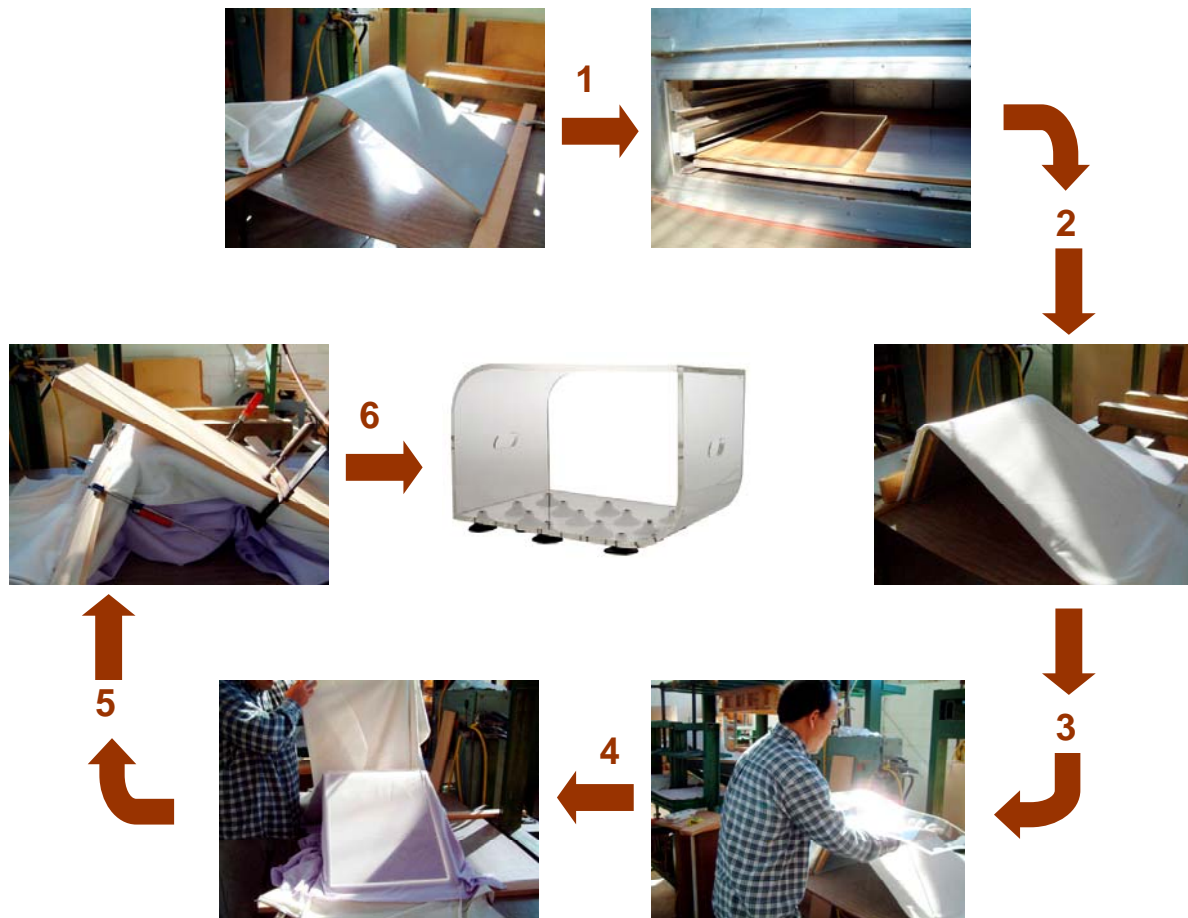


Figure 18 Prototyping process

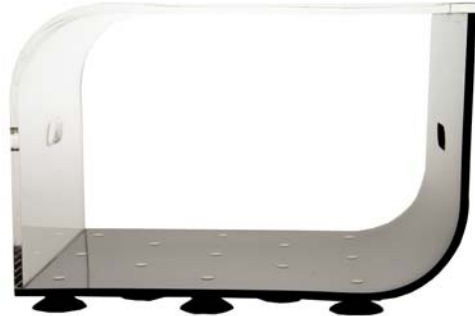
1. Metal mould with built-in wooden frame for reinforcement. Moulds one acrylic panel at a time. Acrylic panel cut to size and put into an oven to heat up to 165° for 30-45 minutes.
2. Thick cotton fabric placed on top of metal mould to smooth the heating process to maintain an even acrylic surface.
3. Heated acrylic panel became soft and easy to bend, it was then placed on top of the fabric.
4. A second layer of fabric is laid on top of the moulded acrylic panel to provide a smooth cover before clamping with MDF boards.
5. MDF boards are clamped to the mould on both sides for an hour and a half to reinforce the position of the moulding process. This helps avoid heat wave created bubbles on the acrylic surface.
6. Final prototype is completed by joining two panels with quick bond glue.

4.5 Final Prototypes

The following shows the prototypes of display units A, B, C, D and E.



Display Unit A
Clear Acrylic with Suction Cups
(525Lx350Wx355H, 5Kg)



Display Unit B
Clear & Black Acrylic with Suction Cups
(525Lx350Wx355H, 5Kg)



Display Unit C
Black Acrylic with Rubber Buffer
(525Lx350Wx355H, 5Kg)



Display Unit D
White Acrylic with polyurethane Spikes
(525Lx350Wx355H, 5Kg)



Display Unit E
Clear & White Acrylic with Rubber Mat
(525Lx350Wx355H, 5Kg)

Figure 19 Series of prototypes



Figure 20 Final prototypes

The basic acrylic colours – black, white and clear – are used to establish if colour relates to the emotional responses. The designs are limited through an examination of the design features that are preferred by survey respondents. The relationship between the user and the display unit is considered, relating the sensation of touch and the visual appearance of the display units.

Following is the summary of selected materials for prototyping and the assumption of emotional qualities that may be created.

Clear acrylic – its brightness produces the impression of being free and open. It is ideal for the smaller interior space. Generally, clear acrylic is often perceived as cold, but smooth and warm to

the touch. Its clear, almost invisible look provides an interesting way of displaying items. It is as if they were floating in the air. The transparency creates shadows that suggest new design elements.

White acrylic – white produces the impression of cleanliness and spaciousness, which enhances the spatial quality of a smaller space and makes the displayed items stand out. It is easy to match with any interior background colour.

Black acrylic – black gives the impression of stability and elegance. It is often perceived as a popular colour in fashion.

Combination of clear and black or white acrylic – gives a sense of the different levels of weight and distance. It creates an illusion of depth and makes the interior space interesting and fun.

Suction cups – rubber provides skin-like sensuality. It has a creature feel and look with multi-cupped legs, which gives a fun and playful impression. The suction cups also function as connectors for stacking.

Rubber Mat – its resilient and soft texture provides sensual tactile pleasure to the users.

Flush caps – protruding dot profiles on internal base as a design feature. They provide tactile sensation.

Handle hole – as a design feature for easy handling.

The display units have been evaluated and the user's aesthetic responses to the above qualities are detailed in the next chapter.

Chapter 5

Evaluation of Prototypes

Evaluation is an important activity in the design process. It provides a method for testing design assumptions and intentions relative to the target consumer (Jordan, 2000). The evaluation involves 80 consumers answering 12 questions, two focus groups of eight participants each, and one-to-one interviews with two furniture retailers and two professional designers. Ethical issues for the evaluation met the requirements of the AUT Ethics Committee (refer to Appendix A on page 91). The ethics application details the evaluation design, method of participants' selection and the information sought. Significant findings from the evaluation are summarised in this chapter.

5.1 Survey Questionnaire






The questionnaire is structured to evaluate participants' aesthetic responses to prototypes. All questions are single or multiple choice which simplifies analysis. A sample is included in Appendix C on page 116. The questionnaire has two parts. **Part A** is designed to gather participants' personal details. It seeks information about the consumer in order to characterise their demographic position. This includes general questions about gender, age, cultural background and lifestyle. **Part B** is designed to evaluate participants' emotional responses, especially through their reaction to subjective qualities in the display units, and the empathic relationship between the display unit and participant.

Table 1: The personal details of survey participants.

Part A. Participant Details		N = Total number of participants = 100%	
Questions	Information	N=80	100%
Gender	Male	49	61.25
	Female	31	38.75
Age Group	20-24	36	45
	25-29	24	30
	30-34	7	8.75
	35-39	5	6.25
	40-44	2	2.5
	45-49	1	1.25
	50-54	4	5
	55 or over	1	1.25
Ethnic Group	Maori	3	3.75
	Pakeha	23	28.75
	Asian	46	57.5
	Pacific Islander	1	1.25
	Other	7	8.75
What type of dwelling are you living in?	Apartment	20	25
	Town House	19	23.75
	Detached House	38	47.5
	Other	3	3.75

Participants were randomly picked on the street in Auckland. Most participants in the survey were male (61.25%). There were a wide range of ages, but 45% were between 20 and 24 years of age. There were more Asian (57.5%) participants than participants from other ethnic groups. Nearly half of the participants (47.5%) live in a detached house.

Table 2: The frequency ranks of participants' preferred design options.

Part B. Display Shelves Evaluation						
Question 1: Please rank 1, 2, 3, 4 and 5 in order of your preference of the following display shelf design.						
Display Shelves	Ranking of Design Preference					Frequency Rank
	1st	2nd	3rd	4th	5th	
A 	11	8	9	17	34	5th
B 	13	20	15	26	9	4th
C 	17	33	9	10	11	2nd
D 	5	10	27	20	19	3rd
E 	34	9	20	8	7	1st
N=80	80	80	80	80	80	

Based on the highest frequency counts of design preferences, **Display Shelf E** is ranked as first preference (first choice) by 34 out of 80 participants






Display Shelf C is ranked as second preference by 33 out of 80 participants.

Display Shelf D is ranked as third preference by 27 out of 80 participants.

Display Shelf B is ranked as fourth preference by 26 out of 80 participants.

Finally, **Display Shelf A** is ranked as fifth preference by 34 out of 80 participants.

Table 3: The emotional responses of participants to their **first choice** (refer to Table 2) display shelf design.

Question 2: Please put a tick below the phrase in each row that best describes your feeling about the display shelf you preferred the most.					
1 st Choice Ranking	1st	2nd	3rd	4th	5th
Display Shelves					
	E	C	B	A	D
N=80	n=34	n=17	n=13	n=11	n=5
Very Amusing	2	2	-	3	1
Amusing	16	12	7	5	1
Indifferent	9	2	5	2	2
Not Amusing	4	1	1	1	-
Not Amusing At All	3	-	-	-	1
N=80	n=34	n=17	n=13	n=11	n=5
Very Inspiring	1	3	2	5	-
Inspiring	23	8	6	4	3
Indifferent	6	5	5	-	1
Not Inspiring	3	1	-	2	-
Not Inspiring At All	1	-	-	-	1
N=80	n=34	n=17	n=13	n=11	n=5
Very Desirable	6	5	3	6	1
Desirable	19	7	7	4	3
Indifferent	8	4	2	1	1
Not Desirable	1	-	1	-	-
Not Desirable At All	-	1	-	-	-

Based on participants' most preferred (first choice) display shelves designs, the most popular design, **Display Shelf E**, was found *amusing* by 16 out of 34 participants; 23 out of 34 participants found it *inspiring* and 19 out of 34 participants found it *desirable*.

For the second popular design, **Display Shelf C**, 12 out of 17 participants found it *amusing*, 8 out of 17 participants found it *inspiring* and 7 out of 17 participants found it *desirable*.

For the third popular design, **Display Shelf B**, 7 out of 13 participants found it *amusing* and *desirable* and 6 out of 13 participants found it *inspiring*.

For the fourth popular design, **Display Shelf A**, 5 out of 11 participants found it *amusing* and *very inspiring*, and 6 out of 11 participants found it *very desirable*.

For the fifth popular design, **Display Shelf D**, 2 out of 5 participants found it *indifferent*, and 3 out of 5 participants found it *inspiring* and *desirable*.






In the overall result the majority of participants found these emotional qualities (amusing, inspiring and desirable) in the display shelves' design.

Table 4: The aesthetic impressions of participants regarding the designs.

Question 3: How would you describe the appearance of the five display shelves?		
Appearance	N=80	100%
Very Beautiful	9	11.25
Beautiful	51	63.75
Indifferent	20	25
Ugly	-	-
Very ugly	-	-

In the evaluation, 9 out of the 80 participants found five of the display shelves *very beautiful*. 51 out of the 80 participants (63.75%) found five of the display shelves *beautiful*. 20 out of the 80 participants were indifferent to the shelves. None of the participants found the shelves *ugly* or *very ugly*.

Table 5: The display shelf that most accurately reflects their personality.

Question 4: Which of the display shelves do you feel best reflects your personality?					
1 st Choice Ranking	1st	2nd	3rd	4th	5th
Display Shelves					
	E	C	B	A	D
N=80	n=34	n=17	n=13	n=11	n=5
A	2	2	2	7	-
B	-	-	7	1	-
C	1	11	1	-	-
D	-	-	1	1	4
E	28	4	1	1	-
None	3	-	1	1	1

28 out of 34 participants said **Display Shelf E** reflected their personality.

11 out of 17 participants said **Display Shelf C** reflected their personality.






7 out of 13 participants said **Display Shelf B** reflected their personality.

7 out of 11 participants said **Display Shelf A** reflected their personality.

4 out of 5 participants said **Display Shelf D** reflected their personality.

These findings suggest that most participants prefer shelving that reflects their personality.






Table 6: Secondary function that participants would use their preferred shelf for.

Question 5: Please tick one other function you would use your display shelf for.					
1 st Choice Ranking	1st	2nd	3rd	4th	5th
Display Shelves					
	E	C	B	A	D
N=80	n=34	n=17	n=13	n=11	n=5
Sculpture	3	3	3	3	3
Space Divider	10	5	2	2	-
Coffee Table	16	8	6	4	1
None	-	-	1	-	1
Other	5	1	1	2	-

16 out of 34 participants would use **Display Shelf E** as coffee table. Similarly, participants would use **Display Shelf C**, **Display Shelf B** and **Display Shelf A** as coffee tables. With **Display Shelf D**, 3 out of 5 participants would use it as sculpture.






Most of the participants preferred display shelves that offer extra functionality of use as a coffee table, followed by use as a sculpture and space divider.

Table 7: The ideal location in the home for the preferred design.

Question 6: Please tick one area in your house where you would locate this display shelf.										
1 st Choice Ranking	1st		2nd		3rd		4th		5th	
Display Shelves										
	E		C		B		A		D	
N=80	n=34	100%	n=17	100%	n=13	100%	n=11	100%	n=5	100%
Living Area	19	55.88	9	52.94	2	15.38	6	54.54	2	40
Dining Area	3	8.82	-	-	4	30.76	1	16.66	-	-
Kitchen	1	2.94	1	5.88	-	-	-	-	-	-
Bedroom	5	14.70	4	23.52	2	15.38	1	16.66	-	-
Study Room	5	14.70	2	11.76	3	23.07	3	50	2	40
Kid's Room	-	-	-	-	1	7.69	-	-	1	20
Other	1	2.94	1	5.88	1	7.69	-	-	-	-

According to the participants, the living area is the ideal space to locate the shelving, followed by dining area and study room.






Table 8: The pride that participants would derive from owning their preferred design.

Question 7: Would you feel proud to own this display shelf?					
1 st Choice Ranking	1st	2nd	3rd	4th	5th
Display Shelves					
	E	C	B	A	D
N=80	n=34	n=17	n=13	n=11	n=5
Yes	13	7	4	6	1
A little	19	8	8	2	2
No	2	2	1	3	2

19 out of 34 participants would feel a little proud to own **Display Shelf E**. As 8 out of the 17 participants regarding **Display Shelf C** and 8 out of 13 participants regarding **Display Shelf B**, they would also feel a little proud to own the shelves. 6 out of 11 participants would definitely feel proud to own **Display Shelf A**. 2 out of 5 participants would feel a little proud and 2 out of participants were not proud to own **Display Shelf D** respectively.

Most of the participants would feel reasonably proud of their preferred display shelf.

Table 9: Purchasing choices.

Question 8: Would you buy this display shelf?					
1 st Choice Ranking	1st	2nd	3rd	4th	5th
Display Shelves					
	E	C	B	A	D
N=80	n=34	n=17	n=13	n=11	n=5
Yes	8	4	3	5	2
May be	19	9	7	3	2
No	6	4	3	3	1

19 out of 34 participants may be interested to buy **Display Shelf E**. 9 out of 17 participants may be interested to buy **Display Shelf C**, and 7 out of 13 participants may be interested to buy **Display Shelf B**. 5 out of 11 respondents would buy **Display Shelf A**. 2 out of the 5 participants would buy **Display Shelf D** and 2 out of 5 may be interested to buy **Display Shelf D** respectively.

The majority of the respondents may consider purchasing the display shelf they desire.

5.2 Focus Groups

Sixteen participants were randomly selected on the streets in Auckland to participate in the focus groups. Two focus groups of 8 participants were formed. Participants' ages range from 20 to 40 years old with a wide range of ethnic groups, such as Pakeha, Asian and Maori. The majority of the participants are students and white collar workers.

The focus groups evaluated consumer's preferences and aesthetic responses towards the design attributes of the display shelf prototypes. Participants were asked to discuss the design and emotional aspects of the prototypes. They were also encouraged to touch, lift, stack and play with the prototypes. The focus groups' dialogue is included in Appendix D on page 120.

Table 1

Question 1	Do you think that display shelves should be incorporated with emotional value (aesthetic appearance) beside their functions?
Significant Points	<ul style="list-style-type: none">• 8 out of the 16 respondents think display shelves that are designed to look attractive also need to be functionally usable.• 4 out of the 16 respondents think display shelves should be designed with high emotional value to draw more attention from people. To them, functionality came second.• 4 out of the 16 respondents emphasised utility; they think display shelves should be designed as purely functional rather than having emotional value.

Incorporating emotional value into the display shelving design is as important as the function.

People's emotional response to a product's design attributes is personal; this reflects the person's design preferences, cultural status and life stage.

Table 2

Question 2	Do you care whether display shelves have emotional value or not?
Significant Points	<ul style="list-style-type: none">• 12 out of the 16 respondents think the aesthetic appearance (attractiveness) of display shelves is their prior concern in the buying decision, but 4 out of the 16 respondents do not.






Emotional value in shelving design is derived from its aesthetic appearance. An attractive display shelf has more emotional value, which plays an important role in determining respondents' aesthetic response and purchasing choices.

Table 3

Question 3	Are you willing to pay more for a display shelf that is aesthetically more pleasing and pleasurable to own?
Significant Points	<ul style="list-style-type: none">• 13 out of the 16 respondents were willing to pay a premium for display shelving that looks cool, unique, is fun to interact with and matches their personality. They believe this contributes to the enjoyment of owning shelving.

Display shelves that offer visual and tactile interest are more desirable.

Table 4

Question 4		How would you describe the 5 display shelves? Do you think that they evoke emotions?	
The following shows the respondents' visual and tactile aesthetic responses towards the design attributes of display shelving.			
Significant Points			
Display Shelves	Aesthetic Responses (Emotions)		Other Function
	Visual	Tactile	
A 	<ul style="list-style-type: none">Clear look fragile (like glass), feels insecureClear look cheap because it is similar to clear plasticHandles as design features	<ul style="list-style-type: none">Sticky – Finger print on surface obvious on clear acrylicWarm material – acrylic	<ul style="list-style-type: none">StoolStereo/TV Stand or shelves
B 	<ul style="list-style-type: none">Suction cups & dot features look trendy, amusing & almost creature- likeCombination of black & white formed striking contrast & make the clear look more like glassAnti-slide rubber legs prevent push & spilling of coffeeLook sculptural, with more detailed visual information involvedCurve corner look modern & stylishBlack base look more stable and bigger	<ul style="list-style-type: none">Combination of soft rubber & hard acrylic create interesting tactile feelRubber reduces noise when stacking & provides stabilityPortable size & grabhandle for easy moving & flexibility	<ul style="list-style-type: none">Kid's stoolSuction wall shelvesFull height stacking shelvesBedside shelvesCoffee tableLight box – tracing
C 	<ul style="list-style-type: none">Black look classy, stronger (solid), fashionableGlossy shining look more modern, suitable for interiorSolid black look like wood painted with blackSolid black colour look heavier & sturdy	<ul style="list-style-type: none">Weight is lighter than its actual heavy appearance	<ul style="list-style-type: none">Magazine holderContainerStacked phone seat
D 	<ul style="list-style-type: none">White look cleaner & lasts longerSolid white look like wood painted with whiteSolid white colour look heavier & sturdy	<ul style="list-style-type: none">Interesting spiky profile underneath, provides strong grip on carpet floor	<ul style="list-style-type: none">Stacked tableSocial party chairs
E 	<ul style="list-style-type: none">Dull rubber mat surface look least worthy, but heavy-duty more suitable for outdoor use	<ul style="list-style-type: none">Rubber texture felt rough	<ul style="list-style-type: none">Outdoor shoes box cleaning mat
Overall Aesthetic Impressions			
<ul style="list-style-type: none">Each display shelf evoked emotions including positive, negative and mixed emotions.Based on respondents' first impressions the designs are unconventional and are more like objects of art.By feeling and looking at the full-size prototypes, Display Shelf B is preferred. 11 out of the 16 respondents preferred it for its detail and colour combination. Display Shelf E received less attention.12 out of the 16 respondents think display shelves should be designed to be different and unique, to enhance the display.10 out of the 16 respondents preferred display shelves that offered more than one application.13 out of the 16 respondents think the basic colours (black, white and clear) in the display shelving are easy to match with the contemporary home interior.The modular system and portable size are ideal for apartment spaces. Their flexibility allows multiple arrangements.The reasonable weight and handle holes make the shelves easy to shift around.The display shelving is suitable for kids because the large round corners are safe, fun and sturdy.			

Overall, **Display Shelf B** is preferred by the focus groups. The results from the focus groups are different from the survey, where **Display Shelf E** is the most popular. Survey participants form their opinion through images, whereas focus groups have the opportunity to interact with the prototypes. Perhaps the real enjoyment of product use comes from touching, feeling and moving around the

physical objects. People's sensory responses are more reliable than visual appearance in determining shelving choice. People's preferences and taste for shelving are conveyed through the aesthetic aspects of the shelf, such as form, colour, material, surface qualities and practical elements.

Table 5

Question 5	Any suggestions or improvements?
Significant Points	<ul style="list-style-type: none"> Wider range of sizes and colours will offer more versatility in applications and suit a wider range of users.

Respondents prefer display shelves with a greater choice of colour and size. Colour and size, as part of the emotional quality of display shelving, play an important role in enhancing the interaction between the shelf and user. This is a significant point and is used as design criteria to develop a series of concepts in the next chapter.

5.3 Interviews

Two professional designers and two furniture retailers were involved because they expressed an interest in the study and had free time to participate in interviews. For anonymity reasons, the names of the designers and retailers are not used. Their titles have been abbreviated as follows: D (Designer) and R (Retailer), and their names were coded as D1, D2, R1 and R2. The interview dialogue is included in Appendix E on page 127.

Table 6

Question 1	There are numerous studies in the last 10 years or so suggesting that products should incorporate emotions beside their functions. What is your view on this?	
Significant Points	D1	<ul style="list-style-type: none"> Designing of the product needs to be approached holistically. Incorporate function and emotion into product. A good product would fit into its environment. Its adaptability and functionality would trigger users' positive emotional responses.
	D2	<ul style="list-style-type: none"> Product design should be a balance between emotion and function; both are important and go hand in hand. As long as it is functional, it is good to go beyond its structure.
	R1	<ul style="list-style-type: none"> Products or furniture should be designed to incorporate emotion, but people expect furniture they love to appeal to their practical requirements.
	R2	<ul style="list-style-type: none"> Emotion is very personal and intuitive. Practical people like products that work, but some people think products that look good and feel good tend to work better. Product design should start with function to make sure a product works, then instinctively the feel, look and touch comes in.

Products should be designed to incorporate both emotional value and function to satisfy users' emotional and functional needs.

Table 7

Question 2	Do you think that display shelves should be designed with emotional value?	
Significant Points	D1	<ul style="list-style-type: none"> Function comes first. Emotional value in display shelves equal to the flexibility, usability and practicality that portrays the system.
	D2	<ul style="list-style-type: none"> Display shelves should be designed with practical and emotional value.
	R1	<ul style="list-style-type: none"> Emotional value is important in display shelf design, but it needs to be practical too. For domestic environments, people want their home décor to speak about their personality. Shelf design should have high emotional content compared to commercial use, where shelves should be secondary to the merchandise that is displayed on them.
	R2	<ul style="list-style-type: none"> Depends on the context.

Emotional value in a display shelf may be derived from the practical use of shelving. Pleasure use of shelving can be derived from what it looks like or the aesthetic (visual and tactile) aspects.

Table 8

Question 3	Are consumers willing to pay more for furniture that is aesthetically more pleasing and pleasurable to own?	
Significant Points	D1	<ul style="list-style-type: none"> Pleasure in shelving comes from flexibility, usability and practicality. Those elements make shelves “beautiful” and work well, and choice of material is important. If it fits the consumer’s requirements and triggers positive emotions then they will be happy to own it. Product aesthetics are very important because they are emotional, but emotion is inherent in an object rather than transparent. Product emotion is elicited by looking closely at all details and at how it is made (construction); a well-thought out object is quite often very beautiful because of its usability.
	D2	<ul style="list-style-type: none"> Consumers would pay more for furniture that is aesthetically more pleasing and with various sizes to meet their requirements, but consumers’ personal perceptions differ. In general, the product’s aesthetic appearance is what attracts the consumers to begin with and interest in and how the product functions is secondary.
	R1	<ul style="list-style-type: none"> Consumers would pay more for furniture design with added emotional value, that is that fulfils its purpose (functional) and has aesthetic qualities. Furniture design that brings pleasure to people mainly relies on the intelligent use of materials and strong design cautions – a small detail feature would need to have something humorous and intelligent about it in visually, functionally, more challenging and interesting.
	R2	<ul style="list-style-type: none"> Consumers are willing to pay more as long as the furniture works, looks good and feels good.

Consumers are happy to pay more for furniture that is attractive, interesting and usable. Consumers’ emotional response to furniture is determined by the use of material and intelligent design that constitutes its aesthetic appearance and performance.



Table 9




Question 4	Do consumers care whether display shelves have emotional value or not?	
Significant Points	D1	<ul style="list-style-type: none"> Besides emotional value, consumers are also concerned about shelving <i>flexibility</i>, <i>usability</i>, and <i>practicality</i> and to <i>look</i> as well.
	D2	<ul style="list-style-type: none"> Consumers' initial attention to and preferences regarding product appearance contribute to the emotional value of the product.
	R1	<ul style="list-style-type: none"> Display shelving purchased for domestic use should have emotional value because attractive display shelving could offer aesthetic pleasure to its owner. Similarly, from the perspective of retail interior design, well-designed display shelving would add to the overall <i>aesthetic shopping experience</i> for consumers.
	R2	<ul style="list-style-type: none"> Individual emotional preferences for a particular product are personal and subjective.

Display shelving design must have emotional value, such as beauty and practicality, to attract consumers' attention and offer consumers an aesthetic experience.

Product appearance and aesthetics are important in determining emotional responses, but aesthetic responses vary among people due to personal emotions and preferences.

Table 10

Question 5	How would you describe the five display shelves? Do you think that they evoke emotions?	
Significant Points	D1	<ul style="list-style-type: none"> All products evoke emotions: either looking at it (visual aesthetic) or interacting with it (tactile aesthetic). The five display shelves are quite <i>playful</i>, <i>whimsical</i>, kind of <i>cute</i>, <i>funny</i> and <i>entertaining</i>, due to association with the little rubber features. The emotional reaction is aesthetically pleasing; as the Italian designer Achille Castiglioni said "every product has to be humorous". Practically, they are modular and flexible, and would be suitable for anywhere domestic or a retail store.  C <ul style="list-style-type: none"> Display Shelf C is the most preferred shelf. Rectilinear form is beautiful, perhaps the horizontal line more than the vertical. The long line make the space much bigger and vertical.
	D2	<ul style="list-style-type: none"> They <i>look playful</i>, perhaps the mixed use of solid and soft materials. The high shining gloss finish and the soft curve look rather organic. The free-form shelves' configurations are cool.  E <ul style="list-style-type: none"> Display Shelf E is the most preferred shelf, because the shape looks stronger, and because of the <i>clean line</i> connection, the high gloss and simplicity.

	R1	<ul style="list-style-type: none"> The five display shelves are quite sculptural, cute and cool.  E <ul style="list-style-type: none"> Display Shelf E is the most preferred shelf. It is harder to see the rubber mat underneath when stacking. Acrylic clean in finishes is appealing and applicable at any situations. "I think they are <i>pretty cool</i>, they have the sculptural quality but I would give them a practical purpose if I used them at home".
	R2	<ul style="list-style-type: none"> Practically, the five display shelves are suitable to use as retail display shelves. These shelves also suitable for home as coffee table and divider. Good stackable idea, easy to rearrange on counter, floor and shop window.  A  B <ul style="list-style-type: none"> Display Shelf A & B with suction cups look like a squid and caterpillar. Display Shelf E is the most preferred shelf. Different emotional responses triggered by the shelves is dependant on context; the changeable emotion depends on how the shelves are arranged; they might express or change emotion when changing shapes (shelving configurations).

Retailers and designers preferred simple designs with playful appearances. They believe product design should be infused with these types of elements to provide emotional value and enhance people's living.

Table 11

Question 6	Any suggestions for improvements?	
Significant Points	D1	<ul style="list-style-type: none"> Improve connection detail, reconsider the attachment between the units, and avoid suction cups stacking out at the edge. Further simplify the joining method; making it easier may minimize the amount of manufacturing time because the biggest expense in furniture making in New Zealand today is labour. Keep the design solution simple and easy for shipping as no waste of space.
	D2	<ul style="list-style-type: none"> Suggest divider within the shelf space.
	R1	<ul style="list-style-type: none"> Offer a range of size options to create a more varied looking piece of furniture.
	R2	<ul style="list-style-type: none"> More colourful shelves would elicit more emotional response and provide users with more options. The 5kg shelf weight is reasonable, but consider mass shipping and transportation.

Display shelving design needs to incorporate space-saving issues, joining details, and offer size and colour choices.

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References

Books and Journals

- Abentroth, U., Philips, K. B., Pixis, C., & Stenbach, V. (Eds). (1999). *World Design: The Best in Classic and Contemporary Furniture, Fashion, Graphics, and More*. Bonn, Germany: Chronicle Books LLC.
- Alessi. (1998). *Alessi the Design Factory*. London: Academy Editions.
- APME. (1997). *Plastics in Perspective*. Association of Plastics Manufacturers in Europe.
- Archer, B. (1984). 'Systematic Method for Designers'. In N. Cross (Ed.), *Developments in Design Methodology*. Brisbane: John Willey & Sons.
- Arnheim, R. (1974). *Art and Visual Perception: A Psychology of the Creative Eye*. Berkeley, California: University of California Press.
- Arnheim, R. (2004). *Visual Thinking*. University of California Press.
- Austin, J. L. (1975). *How to Do Things with Words*. New York: Oxford University Press.
- Bachelard, G. (1994). *The Poetics of Space*. Boston: Beacon Press.
- Bloch, P. H. (1995). 'Seeking the ideal form: Product design and consumer response'. *Journal of Marketing*, Vol. 59 (Issue 3), pp. 16–29.
- Cagan, J., & Vogel, C. M. (2001). *Creating Breakthrough Products: Innovation from Product Planning to Program Approval*. Financial Times/Prentice Hall.
- Coates, D. (2002). *Watches Tell More Than Time: Product Design, Information and the Quest for Elegance*. Sydney: McGraw-Hill Publishing Co.
- Cross, N. (Ed.). (1984). *Developments in Design Methodology*. Brisbane: John Willey & Sons.
- Cross, N. (1999). 'Design Research: A Discipline Conversation'. *Design Issues*, 15(2), pp. 5–9.
- Cross, N. (2000). *Engineering Design Methods: Strategies for Product Design* (3rd edn): John Wiley & Sons.
- Cross, N. (2001). 'Designerly Ways of Knowing: Design Discipline Versus Design Science'. *Design Issues*, 17(3), pp. 49–55.
- Crozier, R. (1994). *Manufactured Pleasures: psychological responses to design*. New York: Manchester University Press.
- Csikszentmihalyi, M., & Robinson, R. E. (1991). *The Art of Seeing: An Interpretation of the Aesthetic Encounter*. Oxford: J. Paul Getty Trust Publications.
- Csikszentmihalyi, M., & Rochberg-Halton, E. (1981). *The Meaning of Things: Domestic Symbols and the Self*. Melbourne: Cambridge University Press.
- De Chiara, J., Panero, J., & Zelnik, M. (1992). *Time-Saver Standards for Interior Design and Space Planning*. Singapore: McGraw-Hill.
- Dietz, M., & Monninger, M. (Eds). (1992). *Japan Design*. Frankfurt: Taschen.
- Doczi, G. (1981). *The Power of Limits: Proportional Harmonies in Nature, Art, and Architecture*. Boston: Shambhala Publications.
- Egner, E. (2002). *Moble: Nils Holger Moormann*. Festhalle: Moormann Mobil.
- Feill, C., & Feill, P. (Eds). (2001). *Designing the 21st Century*. Koln: Taschen GmbH.

- Goldschmidt, G. (2003). 'The Backtalk of Self-Generation Sketches'. *Design Issues*, 19(1), pp. 72-88.
- Good, J. V., & Good, P. (2001). 'Is Functionalism Functional? The Relationship Between Function and Purity'. In D. Holland (Ed.), *Design Issues*. New York: Allworth Press.
- Green, W. S., & Jordan, P. (Eds). (2002). *Pleasure with Products: Beyond Usability*. London: Taylor and Francis.
- Green, W. S., & Jordan, P. W. (Eds). (1999). *Human factors in product design: current practice and future trends*. London: CRC Press.
- Howarth, E. (1990). *Crash Course in Architecture*. London: Headline Book Publishing PLC.
- Jordan, P. W. (2000). *Designing Pleasurable Products: An Introduction to the New Human Factors*. London: CRC Press.
- Jordan, P. W. (2002). *How to Make Brilliant Stuff That People Love & Make a Big Bunch of Money Out of It*. West Sussex: John Wiley and Sons Ltd.
- Jordan, P. W. (2002). 'The Personalities of Products'. In W. S. Green & P. Jordan (Eds), *Pleasure with Products: Beyond Usability*. London: Taylor and Francis.
- Kankainen, A. (2003). 'UCPCD: user-centered product concept design'. Designing For User Experiences, 2003 Conference on Designing for User Experiences. San Francisco, California.
- Kazmierczak, E. T. (2003). 'Design as Meaning Making: From Making Things to the Design of Thinking'. *Design Issues*, 19(2), pp.45-59.
- Krampen, M. (1995). 'Semiotics in Architecture and Industrial/Product Design'. In V. Margolin & R. Buchanan (Eds), *The Idea of Design: A Design Issues Reader* (pp. 89–103). London: The MIT Press.
- Krippendorff, K. (1995). 'On the Essential Contexts of Artifacts or on the Proposition That "Design Is Making Sense (of Things)"'. In V. Margolin & R. Buchanan (Eds), *The Idea of Design: A Design Issues Reader*. London: The MIT Press.
- Lefteri, C. (2001). *Plastic: Materials for Inspirational Design*. London: RotoVision.
- Lewis, D., & Bridger, D. (2001). *The Soul of the New Consumer*. London: Nicholas Brealey Publishing.
- Marcus, C. C. (1997). *House as a Mirror of Self: Exploring the Deeper Meaning of Home*. Berkeley: Conari Press.
- Mayall, W. H. (1968). *Machines and Perception in Industrial Design*. London: Studio Vista.
- McDonagh, D., Hekkert, P., van Erp, J., & Gyi, D. (Eds). (2003). *Design and Emotion*. New York: Taylor and Francis Group.
- Moody, D. (2002). 'Empirical Research Methods'. Paper Presented at the Research Methods Class, Monash University, Melbourne, Australia.
- Morgenstern, J. (2000). *Organizing from the Inside Out*. Sydney: Hodder Headline Australia Pty Limited.
- Murphy, P. (Ed.). (1993). *By Nature's Design*. Photographs by William Neill, San Francisco: Chronicle Books and the Exploratorium.

- Norman, D. A. (2004). *Emotional Design: Why We Love (or Hate) Everyday Things*. New York: Basic Books.
- Palmer, J. (1996). 'Need and Function: the term of debate'. In J. Palmer & M. Dodson (Eds), *Design and Aesthetics: A Reader* (pp. 110–22). London: Routledge.
- Palmer, J. (1996). 'Introduction to Part 1'. In J. Palmer & M. Dodson (Eds), *Design and Aesthetics: A Reader* (pp. 3–12). London: Routledge.
- Pantzar, M. (2000). 'Consumption as Work, Play, and Art: Representation of the Consumer in the Future'. *Design Issues*, 16(3), pp. 3–18.
- Papanek, V. (1984). *Design for the Real World: Human Ecology and Social Change*. Chicago: Academic Chicago.
- Petroski, H. (2000). *The Book on the Bookshelf*. New York: Vintage Books USA.
- Philips, & Electronics, R. P. (1999). *Creating value by design: Facts from Philips Design* (Second edn). London: Lund Humphries.
- Postrel, V. I. (2004). *The Substance of Style: How the Rise of Aesthetic Value Is Remaking Commerce, Culture, and Consciousness*. New York: Perennial.
- Radice, B. (1985). *Memphis: Research, Experiences, Results, Failures and Success of New Design*. London: Thames and Hudson.
- Roberts, J. A., & Manolis, C. (November 2000). 'Baby Boomers and busters: an exploratory investigation of attitudes toward marketing, advertising and consumerism'. *Journal of Consumer Marketing*, 17(6), pp. 481–497.
- Roth, S. (1999). 'The State of Design Research'. *Design Issues*, 15(2), pp. 18–26.
- Seago, A., & Dunne, A. (1999). 'New Methodology in Art and Design Research: The Object As Discourse'. *Design Issues*, 15(2), pp. 11–17.
- Sembach, K.-J. (Ed.). (1997). *Modern Furniture Designs 1950–1980. An International Review of Modern Furniture*. Atglen, PA: Schiffer Publishing Ltd.
- Soanes, C., Waite, M., & Hawker, S. (Eds). (2001). *The Oxford Dictionary, Thesaurus, and Wordpower Guide*. New York: Oxford University Press.
- Sparke, P. (1986). *Furniture: Twentieth Century Design*. E P Dutton.
- Stricker, Z. (1999). 'Elicitation Methods in Experimental Design Research'. *Design Issues*, 15(2), pp. 27–39.
- Styles, M. (2002). *PAC-IT Teacher Guide*. Packaging Materials: Polymers.
- Sudjic, D. (Ed.). (2001). *Ron Arad*. London: Laurence King.
- Swann, C. (2001). 'Action Research and the Practice of Design'. *Design Issues*, 18(2), pp. 49–61.
- Sweet, F. (1999). *Frog: Form Follows Emotion*. London: Thames & Hudson.
- Sweet, F. (1999). *Philippe Starck: subverchic design*. London: Thames & Hudson.
- Taylor, S. J., & Bogdan, R. (1998). *Introduction to Qualitative Research Methods* (3rd edn). New York: John Wiley & Sons.
- Tyler, A. C. (1995). 'Shaping Belief: The Role of Audience in Visual Communication.' In V. Margolin & R. Buchanan (Eds), *The Idea of Design: A Design Issues Reader*. London: The MIT Press.

- Underhill, P. (2000). *Why We Buy: The Science of Shopping* (Touchstone Edition). New York: Simon & Schuster.
- Watson, A. (2005). *Mod to Memphis: Design in Colour 1960s–80s*. Sydney: Powerhouse Publishing.
- Woodham, J. (2004). *A Dictionary of Modern Design*. Oxford: Oxford University Press.
- Zaccai, G. (1995). 'Aesthetic Redefined'. In R. Buchanan & V. Margolin (Eds.), *Discovering Design: Explorations in Design Studies*. London: University of Chicago Press.

Electronic Resources

- Alarab, C. (25 August 2005). Generation Y spending trends: Gotta have it. Retrieved August 2005 from http://www.freep.com/money/tech/youngcomps25e_20050825.htm
- Alessi. (2003). Designers and Products. Retrieved October 2005 from <http://www.alessi.com/index.jsp>
- Design Technology Department. (2003). The Memphis Group, Ettore Sottsass, Retrieved July 2006 from <http://www.design-technology.org/memphis1.htm>
- Design and Emotion Society. (1999). 5th Conference on Design & Emotion 2006. Retrieved July 2005 from <http://www.designandemotion.org/contact.php>
- Design Museum. (2006). Marc Newson. Retrieved July 2006 from <http://www.designmuseum.org/design/marc-newson>
- Desmet, P. M. A. (2002, Tuesday, July 26, 2005 at 14:03:54). Designing Emotions – Introduction. Retrieved September 2005 from <http://static.studiolab.io.tudelft.nl/gems/desmet/paperdisgustdesire.pdf>
- Gobe, M. (2001) Emotional Branding. Retrieved September 2005 from <http://www.emotionalbranding.com/>
- Levit, P. (20 March 2004). Generational Differences Denote Differing Buying Behaviours, Per Levit Retrieved. 1 October 2005 from http://www.partnerslevit.com/NewsRoom/WhosWho/AESNewEnergy/BIG/NetDesignPartnership/generational_buying_behavior.html
- Maleki, R. A. (2001). South Dakota State University Project: Great Plains Rapid Prototyping Consortium. Retrieved 25 August 2002 from <http://www.ehr.nsf.gov>
- Neuborne, E., & Kerwin, K. (15 February 1999). Generation Y. Retrieved 6 August 2005 from http://www.businessweek.com/1999/99_07/b3616001.htm
- Quality of Life Research Team. (2003). Quality of life in New Zealand's Eight Largest Cities 2003. Retrieved June 2004 from <http://www.bigcities.govt.nz/pdf/Economic.pdf>
- Quality of Life Research Team. (2004, 16 March 2005). Quality of Life Residents Survey 2004. Retrieved 1 June 2005 from <http://www.bigcities.govt.nz/>
- Payne, J. (17 June 2004). Trend Setting. Retrieved 5 August 2005 from http://www.trendwatching.com/press/aboutourcompany/LifeGoldCoast_170604.html
- Roper, Q. (2000, 8 December 2000). POSTMODERNISM. Retrieved 2005 from http://www.qdesign.co.nz/designhist_postmod.html

- Routio, P. (1999). Beauty of Artefacts. Retrieved 31 August 2005 from
<http://usuarios.iponet.es/casinada/arteolog/155.htm>
- Tiffany, L. (December 2004). Hot Trends for 2005. Retrieved 6 August 2005 from
http://www.trendwatching.com/press/aboutourcompany/Entrepreneur_1204_2.html
- Trendwatching. (2004). Generation C. Retrieved 6 August 2005, from
http://www.trendwatching.com/trends/GENERATION_C.htm
- Yap, L. (2001). Beauty the Key to Future Designs. Retrieved 24 May 2005 from
http://masseynews.massey.ac.nz/_2001/publications_2001/Massey_News/November/Nov_05/stories/design.html

Personal Communications

- Baker, R. (9 June 2003). Personal Conversation with Randalde Baker of De Bruin Judge.
 In P. L. Kong (Ed.). Auckland.
- Barr, J. (16 June 2003). Personal Conversation with Jessica Barr of EON Design Centre.
 In P. L. Kong (Ed.). Auckland.
- Behnke, U. (4 June 2003). Personal Conversation with Ulf Behnke of Katalog.
 In P. L. Kong (Ed.). Auckland.
- Eaton, S. (24 May 2003). Personal Conversation with Sarah Eaton of EON Design Centre.
 In P. L. Kong (Ed.). Auckland.
- Greenwood, N. (3 June 2003). Personal Conversation with Nina Greenwood of Uno Design.
 In P. L. Kong (Ed.). Auckland.
- James, S. (3 June 2003). Personal Conversation with Simon James of Simon James Design.
 In P. L. Kong (Ed.). Auckland.
- Lousich, F. (June 2003). Personal Conversation with Fiona Lousich of The Rubber Plant.
 In P. L. Kong (Ed.). Auckland.
- Matheson, N. (20 June 2003). Personal Conversation with Neil Matheson of Libra Woodworks.
 In P. L. Kong (Ed.). Auckland.
- O'Brien, B. D. (2 August 2002). Personal Conversation with Brien D.O'Brien of Plastic Design Technologies. In P. L. Kong (Ed.). Auckland.
- Smith, C. (21 March 2003). Interview with Catherine Smith of SpaceSmith.
 In P. L. Kong (Ed.). Auckland.
- Stevenson, T. (2003). Personal Conversation with Todd Stevenson of Powersurge Metal Works. In P. L. Kong (Ed.). Auckland.
- Tarrant, T., & Brind, R. (30 June 2003). Personal Conversation with Terry Tarrant and Rob Brind of Modern Signs. In P. L. Kong (Ed.). Auckland.
- Welsford-Ackroyd, N. (30 June 2003). Personal Conversation with Neil Welsford-Ackroyd of Metal Werks. In P. L. Kong (Ed.). Auckland.

Computer Programs

Adobe. (2003). Adobe Photoshop CS. USA: Adobe Systems Incorporated.

SolidWorks. (2005). SolidWorks. USA: SolidWorks Corporation.

Source of Images

Design Museum. (2006). Marc Newson. Retrieved July 2006 from

<http://www.designmuseum.org/design/marc-newson>

Dor, G. (2003). Ecometry: Economics in Attractors, Fractals and Chaos. Retrieved August 2005

from <http://www.ecometry.biz/main.htm>

Graves, M. (2006). Product Design. Retrieved February 2006 from

<http://www.michaelgraves.com/product.asp?mo=gal&tid=4&pid=132>

Grimshaw, S. (2005). *Succulent*. Retrieved July 2005 from [www.sharongrimshaw.com/.../sunset-](http://www.sharongrimshaw.com/.../sunset-succulent.jpg)

[succulent.jpg](http://www.sharongrimshaw.com/.../sunset-succulent.jpg)

Handwerk, B. (26 February 2004). Snowflake Scientist Reveals Secrets Behind Shapes. Retrieved August 2005 from

<http://news.nationalgeographic.com/news/2004/02/photogalleries/snowflakes/photo2.html>

Hasenick, D. (2002). *Octopus tentacles*. Retrieved July 2005 from

<http://www.pbase.com/dbh/image/9200473>

Shongrunden, S. (2002). Sunflower. Retrieved August 2005 from

<http://www.suncitydesign.com/portfolio/photos/sunflower.htm>

Further Readings

Alan Whitefield, T. W. (2005). 'Aesthetics as Pre-linguistic Knowledge: A Psychological Perspective'. *Design Issues*, 21(1), 3–17.

Bennett, A. (2002). 'Interactive Aesthetics'. *Design Issues*, 18(3), pp. 62–69.

Buchanan, R. (1995). 'Wicked Problems in Design Thinking'. In V. Margolin, Buchanan, Richard (Ed.), *The Idea of Design, A Design Issues Reader*. London: The MIT Press.

Buchanan, R. (2001). 'Human Dignity and Human Right: Thoughts on the principles of Human-Centered Design'. *Design Issues*, 17(2), pp. 35–39.

Burn, A. (2000). 'Emotion and Urban Experience: Implications for Design'. *Design Issues*, 16(3), pp. 67–79.

Chapman, J. (2005). *Emotionally Durable Design: Objects, Experiences and Empathy*. London: Earthscan Publications.

Cherkasky, T. (2004). 'Design Style: Changing Dominant Design Practice'. *Design Issues*, 20(3), pp. 25–39.

Doordan, D. P. (2003). 'On Materials'. *Design Issues*, 19(4), pp. 3–8.

Eskilson, S. (2002). 'Color Consumption'. *Design Issues*, 18(2), pp. 17–29.

Feijs, L., & Meinel, F. (2005). 'A Formal Approach to Product Semantics with an Application to Sustainable Design'. *Design Issues*, 21(3), pp. 67–81.

Fisher, T. H. (2004). 'What We Touch, Touches Us: Materials, Affects, and Affordances'. *Design*

- Issues*, 20(4), pp. 20–31.
- Forlizzi, J., & Lebbon, C. (2001). 'From Formalism to Social Significance in Communication Design'. *Design Issues*, 18(4), pp. 3–13.
- Gauthier, P. (1999). 'Technological Intervention and The Malady of Happiness'. *Design Issues*, 15(2), pp. 40–54.
- Glanville, R. (1999). 'Researching Design and Designing Research'. *Design Issues*, 15(2), pp. 80–91.
- Hanington, B. (2003). 'Methods in the Making: A Perspective on the State of Human Research in Design'. *Design Issues*, 19(4), pp. 9–18.
- Jensen, R. (1999). *The Dream Society: how the coming shift from information to imagination will transform your business*. (M. Hebsgaard, Trans.). Auckland: McGraw-Hill.
- Jonas, W. (2001). 'Scenario for Design'. *Design Issues*, 17(2), pp. 64–80.
- Jordan, P. W. (1998). *An Introduction to Usability*. London: CRC Press.
- Margolin, V. (Ed.). (1989). *Design Discourse: History, Theory, Criticism*. Chicago: University of Chicago Press.
- Margolin, V. (2002). *The Politics of the Artificial: Essays on Design and Design Studies*. Chicago: University of Chicago Press.
- Margolin, V., & Buchanan, R. (Eds.). (1996). *The Idea of Design*. London: MIT Press.
- Margolin, V., & Margolin, S. (2001). 'A "Social Model" of Design: Issues of Practice and Research'. *Design Issues*, 18(4), pp. 24–30.
- McCoy, K. (2000). 'Information and Persuasion; Rivals or Partner'. *Design Issues*, 16(3), pp. 80–83.
- Miodownik, M. (2005). 'A Touch Subject'. *Materials Today*, 8 (6).
- Mollerup, P. (2001). *Collapsible: The Genius of Space-Saving Design*. San Francisco: Chronicle Books.
- Morelli, N. (2002). 'Designing Product/Service Systems: A Methodological Exploration'. *Design Issues*, 18(3), pp. 3–17.
- Morello, A. (2000). 'Design Predicts the Future When It Anticipates Experience'. *Design Issues*, 16(3), 35–44.
- Narvaez, L. M. J. (2000). 'Design's Own Knowledge'. *Design Issues*, 16(1), pp. 36–51.
- Negrotti, M. (2001). 'Designing Artificial'. *Design Issues*, 17(2), pp. 4–16.
- Neuhart, J. (1989). *Eames Design: The Work of the Office of Charles and Ray Eames*. New York: Harry N. Abrams Inc.
- Nieusma, D. (2004). 'Alternative Design Scholarship: Working Toward Appropriate Design'. *Design Issues*, 20(3), pp. 13–24.
- Norman, D. A. (2002). *The Design of Everyday Things*. New York: Basic Books.
- Pedgley, O. (2005). 'DDR4 (Designing Design Research 4) Event Review and Reflections'. *Design Issues*, 21(3), pp. 82–85.
- Sommer, R. (1969). *Personal Space: The Behavioral Basis of Design*. New Jersey, Englewood Cliffs: Prentice Hall.
- Tatum, J. S. (2004). 'The Challenge of Responsible Design'. *Design Issues*, 20(3), pp. 66–80.

- Terzidis, K. (2003). 'Hybrid Form'. *Design Issues*, 19(1), pp. 57–61.
- van Veggel, R. J. F. M. (2005). 'Where the Two Sides of Ethnography Collide'. *Design Issues*, 21(3), pp. 3–16.
- Walker, S. (2000). 'How the Other Half Lives: Product Design, Sustainability, and the Human Spirit'. *Design Issues*, 16(1), pp. 52–58.
- Woodhouse, E., & Patton, J. W. (2004). 'Design By Society: Science and Technology Studies and the Social Shaping of Design'. *Design Issues*, 20(3), pp. 1–12.
- Zwerger, K. (1997). *Wood and Wood Joints: Building Traditions of Europe and Japan*. Birkhauser, Switzerland.

Appendices

Appendix A

EA1

Application for Ethics Approval for Research Projects

**Auckland University of Technology Ethics Committee
(AUTEC)**

EA1

APPLICATION FOR ETHICS APPROVAL FOR RESEARCH PROJECTS



Please note that incomplete applications will not be considered by AUTEC. Please do not alter the formatting of this form or delete any sections. If a particular question is not applicable to your research, please state that as your response to that question.

A. General Information

A.1. Project Title

Rethinking Display and Shelving

A.2. Applicant Name and Qualifications

When the researcher is a student (including staff who are AUT students), the applicant is the principal supervisor. When the researcher is an AUT staff member undertaking research as part of employment or a staff member undertaking research as part of an external qualification, the applicant is the researcher. Staff should refer to Section 11.4 of Applying for Ethics Approval: Guidelines and Procedures to check requirements for ethics approval where they are studying at another institution.

Name: Leong Yap

Qualifications/Registration:

MCSD, CNZErg, PhD(Massey), MSc(Loughborough), Dip Ind Des(WP)

A.3. School/Department/Academic Group/Centre

Master of Art and Design

A.4. Faculty

Faculty of Design and Creative Technologies

A.5. Student Details

Please complete this section only if the researcher is a student

A.5.1. Student Name(s):

Kong Pei Leong

A.5.2. Student ID Number(s):

0002249

A.5.3. Qualification(s):

Bachelor of Art (Spatial Design) (AUT)

A.5.4. E-mail address:

peileong@hotmail.com

A.5.5. School/Department/Academic Group/Centre

School of Art and Design

A.5.6. Faculty

Faculty of Design and Creative Technologies

A.5.7. Name of Degree:

Master of Art (Arts and Design)

A.5.8. Research Output

Please state whether your research will result in a thesis or dissertation or a research paper or is part of coursework requirements.

My research will result in an exegesis with 80% of practical work and 20% written component.

A.6. Details of Other Researchers or Investigators

Please complete this section only if other researchers, investigators or organisations are involved in this project. Please also specify the role any other researcher(s), investigator(s) or organisation(s) will have in the research.

A.6.1. Individual Researcher(s) or Investigator(s)

Please provide the name of each researcher or investigator and the institution in which they research.

Nil

A.6.2. Research or Investigator Organisations

Please provide the name of each organisation and the city in which the organisation is located.

Nil

A.7. Are you applying concurrently to another ethics committee?

If your answer is yes, please provide full details, including the meeting date, and attach copies of the full application and approval letter if it has been approved.

No

A.8. Declaration

The information supplied is, to the best of my knowledge and belief, accurate. I have read the current Guidelines, published by the Auckland University of Technology Ethics Committee, and clearly understand my obligations and the rights of the participant, particularly with regard to informed consent.

Signature of Applicant

Date

(In the case of student applications the signature must be that of the Supervisor)

Signature of Student

Date

(If the research is a student project, both the signature of the Supervisor, as the applicant, and the student are required)

A.9. Authorising Signature

Signature of Head

Name of Faculty/Programme/School/Centre

Date

B. Project General Information

B.1. Project Duration

B.1.1. Approximate Start Date of Primary Data Collection

November 2005

B.1.2. Approximate Finish Date of Complete Project

December 2005

B.2. Are funds being obtained specifically for this project?

If your answer is yes, then you must complete section G of this Application Form.

No

B.3. Types of persons participating as participants

Please indicate clearly every one of the following categories that applies to those participating in your research.

B.3.1. Researcher's students

No

B.3.2. Adults (20 years and above)

Yes

B.3.3. Legal minors (16 to 20 years old)

No

B.3.4. Legal minors (under 16 years old)

No

B.3.5. Members of vulnerable groups

e.g. persons with impairments, limited understanding, etc. If your answer is yes, please provide a full description.

No

B.3.6. Hospital patients

No

B.3.7. Prisoners

No

B.4. Does this research involve use of human remains, tissue or body fluids which does not require submission to a Regional Ethics Committee?

e.g. finger pricks, urine samples, etc. (please refer to section 13 of the AUTECH Guidelines). If your answer is yes, please provide full details of all arrangements, including details of agreements for treatment, etc.

No

B.5. Does this research involve potentially hazardous substances?

e.g. radioactive materials (please refer to section 15 of the AUTECH Guidelines). If your answer is yes, please provide full details.

No

B.6. Does the research include the use of a questionnaire?

If your answer is yes, a copy of the questionnaire is to be attached to this application form.

Yes.

A survey will be undertaken to evaluate the prototypes of display shelves.

B.7. Does the research involve the use of interviews?

If the answer is yes, please indicate how the interviews will be recorded (e.g. audiotape, videotape, note-taking). When interviews are being recorded, you will need to make sure there is provision for explicit consent on the Consent Form and attach examples of indicative questions or the full interview schedule to this Application Form. If someone other than the researcher will be transcribing the interview records or taking the notes, you will need to provide a confidentiality agreement with this Application Form.

Yes. I would conduct face to face interviews with at least three professional designers and two furniture retailers.

The interview will be recorded on audiotape and transcribed by the researcher.

B.8. Describe how the principles of the Treaty of Waitangi are being addressed and applied in this project.

Please refer to Section 2.5 of the Guidelines and the HRC Guidelines for Researchers on Health Research on Maori (Appendix G). Consider who might be affected by the project, its possible consequences, consultation issues, partnership issues, etc.

It is not envisaged that this research will have any particular consequences or other cultural issues affecting the Treaty of Waitangi. However, it may involve maori participants in the survey, focus groups or interviews. The aim of this research is to design display shelving systems that could elicit positive aesthetic impressions and experiences to satisfy users' aesthetic pleasure. Therefore, the design project seeks opinion from the general public and involves the general population.

No part of this research is in anyway invasive and is highly unlikely to cause any physical, mental or health problems to the participants. The researcher will be courteous to all participants and be sensitive to all cultural groups.

C. Project Details

Please describe the project details in language which is, as far as possible, free from jargon and comprehensible to lay people.

C.1. Aim of project:

Please explain the broad scope and purpose of the project and state concisely how the type of information being sought will achieve the project's aims. Please give the specific hypothesis(es), if any, to be tested.

This design project is concerned with how mundane shelving can be restyled to attract consumer's attention and evoke positive aesthetic impression (Palmer, 1996). It also explores the notion of aesthetic values (empathic characteristics) rather than merely its functional qualities within the context of "aesthetic consumption" through the consumers' visual and tactile senses. The study would demonstrate how a new and novel design could contribute to consumer's pleasure (hedonic value) through emotional and sensory design of a product.

C.2. Why are you proposing this research?

(ie what are its potential benefits to participants, researcher, wider community, etc?)

Good product design has always been judged on technology and function. However, during the past 10 years or so, considerable emphases have been placed on the less tangible qualities such as emotional attributes that a product conveys. Designing to satisfy human emotion has become a very important design process for the "experience society" of today, and this process is now call "empathic design".

I have focussed my project on empathic design to develop a display system. This research is designed predominantly to gather information on emotions in human visual aesthetic response to "beauty", "coolness", "amusement" etc.

This design project will provide potential benefits in understanding the consumer aesthetic responses to the empathic qualities in the products' visual forms, and as such may cover the wider aspects of people-product relationships. This study will also add to the body of knowledge on research-based evidence about the process of emotional design development, manufacturing and the impact of financial considerations in the creation of empathic shelving. Finally, a survey and consultation will be conducted to verify the emotional aspects of display-shelf design that may play a significant role in determining consumer aesthetic reactions, experiences and purchase choices.

C.3. Background:

Please provide sufficient information, including relevant references, to place the project in perspective and to allow the project's significance to be assessed. Where appropriate, provide one or two references to the applicant's (or supervisor's) own published work in the relevant field.

A study done in the United States showed that 93% of human communication is nonverbal, where messages are transmitted by the speaker's tone of voice and facial expressions. Only 7% of the person's emotions or attitudes are conveyed by words. This indicates that we express our emotion (feeling, meaning) and attitudes without words; therefore, visual communication has become the most important form of communication. (Levine & Adelman, 1993)

In the context of product design, a product's emotional characteristics are conveyed by the product's shape, colour, textures, and all other aspects of its **visible** form. This shapes what and how we feel about it. (Coates, 2003) Research studies had argued that emotional responses to a product could be linked to product aesthetics, e.g. form

and colour. (Jordan, 2000) Hence, it is believed that the emotional quality of a product plays an important role in enhancing the interaction between a product and the users. People's preferences and tastes of a product should be communicated through the product's aesthetics. (Jordan, 2000) Product aesthetics are pertains to what a product appearance presents to the viewer's senses (particularly visual and haptic senses). Consumers' expectations of a product's aesthetic values are not only met by the product's functional characteristics, but their emotional need to feel and physical need for sensory stimulation. (Buchanan & Margolin, 1995) Aesthetics by definition refers to feelings and sensations, which means empathic or emotional design has more aesthetic potential. (Coates, 2003)

This research study is an attempt to reverse the perception of an ordinary shelf by transforming it into a more artistic 'functional' sculpture, infused with aesthetics qualities to capture the audiences' attention, pleasure and aesthetic experiences. Designers are encouraged to shift into a new emphasis from pragmatic to aesthetic by integrating beauty into their product creations to delight the consumers' senses because positive aesthetic experience or pleasure is the important component in every buying decision. (Yap, 2001) Therefore, this project focuses on the importance of capturing human emotions beyond the traditional design emphasis on functionality and materiality.

C.4. Procedure:

C.4.1. Explain the philosophical and/or methodological approach taken to obtaining information and/or testing the hypothesis(es).

Subjective assessments will be carried out via questionnaire survey, interviews and focus groups to elicit emotional responses, preferences and buyers personalities to test the researcher assumptions and aim to encapsulate emotional qualities in the display shelving design.

C.4.2. State in practical terms what research procedures or methods will be used.

1. Survey

A simple questionnaire survey will be conducted to test participants' visual perception and preferences on the aesthetic aspects of the display shelving system.

2. Focus Groups

Two focus groups comprising different demographics – a student group and a young profession group to represent the general public, will be sampled to evaluate and discuss the design. The aim is to ascertain the design appropriateness (utility), manufacturing qualities, preference and participants' aesthetic responses (visual and tactile aesthetics) toward the display shelving system.

3. Design Professional and Retailer Interviews

3 professional designers and 2 furniture retailers will be interviewed to solicit their expert opinions and advices on the aesthetic preferences, design appropriateness, manufacturing qualities, design solution and emotional aspects of the display shelving system.

C.4.3. State how information will be gathered and processed.

1. Survey

50 questionnaires will be administered in Auckland streets.

2. Focus Groups

Focus group discussions will be carried out in the MA Lab at the School of Art and Design.

Focus group information will be video typed and transcribed.

3. Design Professional and Retailer Interviews

Interviews will be done face to face at the interviewees' office or workplace.

Interviews will be audio typed and transcribed.

C.4.4. State how your data will be analysed.

1. Survey

Descriptive statistical analysis will be used to give an 'objective' feedback of the survey. This result will be analysed and compared with findings from the focus groups and interviews to give a more balanced insight of the design outcome.

2. Focus Groups

Analysing, comparing and interpreting the transcripts and comparing them with findings from the survey and interviews would instil rigour and accuracy to the information

3. Design Professional and Retailer Interviews

Experts' opinions from professional designers and furniture retailers are sought to inform design direction, appropriateness and quality at the highest professional and industry levels.

C.4.5. Provide a statistical justification where appropriate.

Only descriptive statistics will be used in the research.

D. Participants

D.1. Who are the participants? What criteria are to be used for selecting them?

1. Survey

50 Participants

Selection methods: Random sampling

Selection Criteria: Approach people on the street or in front of furniture showrooms around Auckland city. Participants will be invited to participate in the survey only after acknowledging interest to take part in the research.

2. Focus Groups

Group 1: 8 to 10 Students

Group 2: 8 to 10 Young Professionals

Selection methods: Random sampling

Selection criteria: Approach people on the street around Auckland city. Participants will be invited to participate in the focus group only after acknowledging interest to take part in the research.

3. Design Professional and Retailer Interviews

3 professional designers and 2 furniture retailers

Selection methods: Random sampling

Selection criteria: Professional designers and furniture retailers will be selected from Industrial, Interior and furniture design practices in Auckland region. Participants will be invited through email and telephone call to seek agreement to be interviewed.

D.2. State whether the participants may perceive themselves to be in any dependent relationship to the researcher (for example, researcher's students).

No

D.3. Are there any potential participants who will be excluded?

If your answer is yes, please detail the criteria for exclusion.

No

D.4. How many participants will be selected?

1. Survey

50 people will be selected from streets and selected furniture showrooms around Auckland city.

2. Focus Groups

Group 1: 8 to 10 Students

Group 2: 8 to 10 Young Professionals

Participants will be selected from the street in Auckland city.

3. Design Professional and Retailer interviews

3 design experts and 2 furniture retailers will be selected from Industrial, Interior and furniture design practices.

D.4.1. What is the reason for selecting this number?

1. Survey

50 participants are considered to be adequate to generate a “snapshot” and pattern to cross examine or triangulate with the other methods used.

2. Focus Groups

8 to 10 participants are considered to be a good size to ensure that all participants could contribute in deep discussion within the group.

3. Design Professional and Retailer interviews

3 design experts and 2 furniture retailers from Industrial, Interior and furniture design practices and retailing is considered to be sufficient to generate appropriate information to inform the direction and quality of the project.

D.4.2. Provide a statistical justification where applicable, if you have not already provided one in C.4 5. above.

Only descriptive statistics will be used.

D.4.3. Is there a control group?

If your answer is yes, please describe and state how many are in the control group.

No

D.5. Describe in detail the recruitment methods to be used.

If you will be recruiting by advertisement, please attach a copy to this Application Form

1. Survey

General public will be randomly selected from streets and selected furniture showrooms around Auckland city via personal contacts.

2. Focus Groups

Participants will be randomly selected from the street in Auckland city via personal contacts.

3. Design Professional and Retailer interviews

3 design experts and 2 furniture retailers will be selected from Industrial, Interior and furniture design practices through email and telephone call to seek agreement to be interviewed.

D.6. How will information about the project be given to participants?

(e.g. in writing, verbally). A copy of information to be given to prospective participants is to be attached to this Application Form. If written information is to be provided to participants, you are advised to use the Information Sheet exemplar.

The information will be given both in writing and verbally

D.7. Will the participants have difficulty giving informed consent on their own behalf?

Consider physical or mental condition, age, language, legal status, or other barriers. If the answer is yes, please provide full details.

No

D.7.1. If participants are not competent to give fully informed consent, who will consent on their behalf?

N/A

D.7.2. Will these participants be asked to provide assent to participation?

If the answer is yes, please attach a copy of the assent form which will be used. Please note that assent is not the same as consent (please refer to the Glossary in Appendix A of the AUTC Guidelines and Procedures).

N/A

D.8. Will consent of participants be gained in writing?

If the answer is yes, please attach a copy of the Consent Form which will be used. If the answer is No, please provide the reasons for this.

Yes

D.9. Will the participants remain anonymous to the researcher?

Please note that anonymity and confidentiality are different. If the answer is yes, please state how, otherwise, if the answer is no, please describe how participant privacy issues and confidentiality of information will be preserved.

No.

Participants' privacy and confidentiality will be observed.

All data will be stored securely in the locked cabinet of the supervisor's office in AUT premises and data will be shredded after six years.

D.10. In the final report will there be any possibility that individuals or groups could be identified?

If the answer is yes, please explain how and why this will happen.

No

D.11. Will feedback or findings be disseminated to participants (individuals or groups)?

If the answer is yes, please explain how this will occur and ensure that this information is included in the Information Sheet.

No

Other Project Details

D.12. Where will the project be conducted?

Please provide the name/s of the Institution/s, town/s, city or cities, region or country that best answers this question.

Survey: Auckland Streets

Focus Groups: AUT, School of Art and Design

Design Professional and Retailer Interviews: interviewees' office

D.13. Who is in charge of data collection?

The researcher Kong Pei Leong

D.14. Who will interact with the participants?

The researcher Kong Pei Leong

D.15. What ethical risks are involved for participants in the proposed research?

Please consider the possibility of moral, physical, psychological or emotional risks to participants.

No risks are envisaged

D.15.1. If there are risks, identify and describe how these will be mitigated.

N/A

D.16. Will there be any other physical hazards introduced to AUT staff and/or students through the duration of this project?

If the answer is yes, please provide details of management controls which will be in place to either eliminate or minimise harm from these hazards (e.g. a hazardous substance management plan).

No

D.17. Are the participants likely to experience any discomfort, embarrassment (physical, psychological, social) or incapacity as a result of the procedures?

If the answer is yes, please identify how and describe how these will be minimised or mitigated.

No

D.17.1. If the answer to E.6. was Yes, have you approached AUT Health and Counselling to discuss suitable arrangements for provision of services to deal with adverse physical or psychological consequences

Please refer to section 2.3 of the AUTECH Guidelines. If the answer is No, please explain the arrangements which have been made to have qualified personnel available to deal with unexpected adverse physical or psychological consequences?

N/A

D.18. Is deception of participants involved at any stage of the research? (Refer Section 2.4 of the AUTECH Guidelines).

If the answer is yes, please provide full details of and rationale for the deception.

No

D.19. How much time will participants have to give to the project?

Survey: 15 minutes for each participant

Focus Groups: 45 minutes for each group

Design Professional and Retailer Interviews: 45 minutes for each interviewee

D.20. Will any information on the participants be obtained from third parties?

If the answer is yes, please provide full details.

No

D.21. Will any identifiable information on the participants be given to third parties?

If the answer is Yes, please provide full details.

No

D.22. Provide details of any payment, gift or koha and, where applicable, level of payment to be made to participants.

Please refer to Section 2.1 of the AUTECH Guidelines and Appendix A for the AUTECH policy on Payment and Koha.

Focus Groups – \$10 shopping voucher will be given to every participant at the end of the discussion.

E. Data and Consent Forms

E.1. Who will have access to the data?

The researcher Kong Pei Leong and Professor Leong Yap

E.2. Are there plans for future use of the data beyond those already described?

The applicant's attention is drawn to the requirements of the Privacy Act 1993 (see Appendix I)

The finding may be used for possible journal articles

E.3. Provide the location and duration of final storage of data.

Note: AUTECH normally requires that the data be stored securely on AUT premises for a minimum of six years in a location separate from the consent forms. If you are proposing an alternative arrangement, please provide the rationale for it.

All data will be stored and locked for six years in the cabinet of Professor Leong Yap's office, located on AUT premises.

E.4. Will the data be destroyed?

If the answer is yes, please describe how the destruction will be effected. If the answer is no, please provide the rationale for this decision.

Yes, audiotapes and videotapes will be wiped and papers will be shredded after six years.

E.5. Who will have access to the Consent Forms?

The researcher Kong Pei Leong and Professor Leong Yap

E.6. Provide the location and duration of final storage of Consent Forms.

Note: AUTECH normally requires that the Consent Forms be stored securely on AUT premises for a minimum of six years in a location separate from the data. If you are proposing an alternative arrangement, please provide the rationale for it.

All consent forms will be stored and locked for six years in the cabinet of the programme leader's office, located on AUT premises.

E.7. Will the Consent Forms be destroyed?

If the answer is yes, please describe how the destruction will be effected. If the answer is no, please provide the rationale for this decision.

Yes, all consent forms will be shredded after six years.

F. Material Resources

F.1. Has application for funds to support this project been (or will be) made to a source external to AUT?

If the answer is yes, please state the name of the organisation(s).

No

F.2. Has the application been (or will it be) submitted to an AUT Faculty Research Grants Committee or other AUT funding entity?

If the answer is yes, please provide details.

No

F.3. Is funding already available, or is it awaiting decision?

Please provide full details.

No

F.4. Explain the investigator's or co-investigator's financial interest, if any, in the outcome of the project.

None

G. Other Information

G.1. Have you ever made any other related applications?

If the answer is yes, please provide the AUTEK application / approval number(s)

No

H. Checklist

Please ensure all applicable sections of this form have been completed and all appropriate documentation is attached as incomplete applications will not be considered by AUTECH.

Section A	General Information Completed	<input type="checkbox"/>
	Signatures/Declaration Completed	<input type="checkbox"/>
Section B	Project General Information Completed	<input type="checkbox"/>
Section C	Project Details Completed	<input type="checkbox"/>
Section D	Participant Details Completed	<input type="checkbox"/>
Section E	Other Project Details Completed	<input type="checkbox"/>
Section F	Data & Consent Forms Details Completed	<input type="checkbox"/>
Section G	Material Resources Completed	<input type="checkbox"/>
Section H	Other Information Completed	<input type="checkbox"/>

Spelling and Grammar Check (please note that a high standard of spelling and grammar is required in documents that are issued with AUTECH approval)

☐

Attached Documents (where applicable)

Participant Information Sheet(s)	<input type="checkbox"/>
Consent Form(s)	<input type="checkbox"/>
Questionnaire(s)	<input type="checkbox"/>
Advertisement(s)	<input type="checkbox"/>
Hazardous Substance Management Plan	<input type="checkbox"/>
Typist Confidentiality Agreement(s)	<input type="checkbox"/>
Other Documentation	<input type="checkbox"/>

Please send one (1) copy (single sided, clipped not stapled) of this application form with all attachments to:

*Charles Grinter, Ethics Coordinator
Wellesley Campus
Room WA208, Level 2, WA Building
55 Wellesley Street East
Private Bag 92006
Auckland 1020, NZ
Internal Mail Code: RC*

MEMORANDUM

To: Leong Yap
From: **Madeline Banda** Executive Secretary, AUTC
Date: 18 October 2005
Subject: Ethics Application Number 05/189 **Rethinking display and shelving.**

Dear Leong

Thank you for providing written evidence as requested. I am pleased to advise that it satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTC) at their meeting on 10 October 2005. Your ethics application is now approved for a period of three years until 18 October 2008.

I advise that as part of the ethics approval process, you are required to submit to AUTC the following:

- A brief annual progress report indicating compliance with the ethical approval given using form EA2, which is available online through <http://www.aut.ac.nz/research/ethics>, including a request for extension of the approval if the project will not be completed by the above expiry date;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/research/ethics>. This report is to be submitted either when the approval expires on 18 October 2008 or on completion of the project, whichever comes sooner;

You are reminded that, as applicant, you are responsible for ensuring that any research undertaken under this approval is carried out within the parameters approved for your application. Any change to the research outside the parameters of this approval must be submitted to AUTC for approval before that change is implemented.

Please note that AUTC grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to make the arrangements necessary to obtain this.

To enable us to provide you with efficient service, we ask that you use the application number and study title in all written and verbal correspondence with us. Should you have any further enquiries regarding this matter, you are welcome to contact Charles Grinter, Ethics Coordinator, by email at charles.grinter@aut.ac.nz or by telephone on 921 9999 at extension 8860.

On behalf of the Committee and myself, I wish you success with your research and look forward to reading about it in your reports.

Yours sincerely



Madeline Banda
Executive Secretary
Auckland University of Technology Ethics Committee

Cc: Kong Pei Leong peileong@hotmail.com

Appendix B

Invitations and Consent Forms to Participate in the Research Project

Consent to Participation in Research

This form is to be completed in conjunction with, and after reference to, the AUTECH Guidelines Version 1.4 (Revised July 1998).

Title of project: Rethinking Display and Shelving

Project Supervisor: Professor Leong Yap

Researcher: Kong Pei Leong

-
1. I have read and understood the information provided about this research project.
 2. I have had an opportunity to ask questions and to have them answered.
 3. I understand that the interview will be audio-taped and transcribed.
 4. I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
 5. If I withdraw, I understand that all relevant tapes and transcripts, or parts thereof, will be destroyed.
 6. I agree to take part in this research.

Participant signature: _____

Participant name: _____

Participant contact details (if appropriate):

Date:

Approved by the Auckland University of Technology Ethics Committee on: 18 October 2005

AUTECH Reference number: 05/189

Note: The participants should retain a copy of this form.

Date Information Sheet Produced: 9 September 2005
(Interviews)

Project Title

Rethinking Display and Shelving

Invitation

I wish to invite you to participate in this research. I am currently studying for a masters degree in Art and Design at Auckland University of Technology. My research is on designing display shelving systems with aesthetic qualities to elicit audiences' emotional responses.

This is a very important part of my research study. Your opinions and advice are very important contributions to the success of my study. I hope that you are able to assist me by sparing some time to participate in the interview.

What is the purpose of the study?

This interview is conducted to seek your opinion on the importance of aesthetics and emotional factors in display shelving design.

How are people chosen to be asked to be part of the study?

Participants will be randomly selected by personal contacts.

What happens in the study?

I will explain the detail of my research aims to you and ask you to answer six questions relating to the aesthetic aspects of shelving design. These questions will be centred on the aesthetic preferences, design appropriateness, manufacturing qualities, design solution and emotional aspects of the shelving design.

What are the benefits?

Your opinion is important to the success of my study. The research findings will enable me to understand emotional needs and wants in furniture design especially display shelves design. Hence, it could benefit designers, retailers and consumers.

How will my privacy be protected?

Confidentiality will be observed. All data and consent forms will be stored securely in the office of the supervisor. All data will be shredded 6 years after the study is completed.

What are the costs of participation in the project? (Including time)

There will be no cost to you other than the 45 minutes or so that are needed for the interview.

Opportunity to consider invitation

Your participation is voluntary. However, this research is important to my study and I will be delighted if you are able to participate.

How do I agree to participate in this research?

You will be required to sign a consent form to participate in this research. However, you will be given some time to consider. If you do agree to take part in the research, please sign the consent form and return it to me in the self-addressed and stamped envelope provided and we can arrange the interview.

Participant Concerns

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor Professor Leong Yap.

Concerns regarding the conduct of the research should be notified to the Executive Secretary, AUTECH, Madeline Banda, madeline.banda@aut.ac.nz, ph 921 9999 ext 8044.

Researcher Contact Details: Kong Pei Leong, peileong@hotmail.com
ph 021 0394527

Project Supervisor Contact Details: Professor Leong Yap, leong.yap@aut.ac.nz
ph 921 9999 ext 8604.

Approved by the Auckland University of Technology Ethics Committee on: 18 October 2005

AUTECH Reference number: 05/189

Consent to Participation in Research

This form is to be completed in conjunction with, and after reference to, the AUTECH Guidelines Version 1.4 (Revised July 1998).

Title of project: Rethinking Display and Shelving

Project Supervisor: Professor Leong Yap

Researcher: Kong Pei Leong

-
1. I have read and understood the information provided about this research project.
 2. I have had an opportunity to ask questions and to have them answered.
 3. I understand that the focus group discussion will be audio-taped and transcribed.
 4. I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
 5. If I withdraw, I understand that all relevant tapes and transcripts, or parts thereof, will be destroyed.
 6. I agree to take part in this research.

Participant signature: _____

Participant name: _____

Participant contact details (if appropriate):

Date:

Approved by the Auckland University of Technology Ethics Committee on: 18 October 2005

AUTECH Reference number: 05/189

Note: The participants should retain a copy of this form.

Date Information Sheet Produced: 9 September 2005
(Focus Groups)

Project Title

Rethinking Display and Shelving

Invitation

I wish to invite you to participate in this research. I am currently studying for a masters degree in Art and Design at Auckland University of Technology. My research is on designing display shelving systems with aesthetic qualities to elicit audiences' emotional responses.

This is a very important part of my research study. Your opinions and advice are very important contributions to the success of my study. I hope that you are able to assist me by sparing some time to participate in the focus group.

What is the purpose of the study?

This focus group is conducted to seek your opinion on the importance of aesthetics and emotional factors in display shelving design.

How are people chosen to be asked to be part of the study?

Participants will be randomly selected by personal contacts in the streets of Auckland city.

What happens in the study?

You will meet as a group of about 8 to 10 people in the masters research lab at the School of Art and Design. I will explain the detail of my research aims to you and ask you to answer six questions relating to the aesthetic aspects of shelving design. These questions will be centred on the aesthetic preferences, design appropriateness, manufacturing qualities, design solution and emotional aspects of the shelving design.

What are the benefits?

Your opinion is important to the success of my study. The research findings will enable me to understand emotional needs and wants in furniture design especially display shelves design. Hence, it could benefit designers, retailers and consumers.

How will my privacy be protected?

Confidentiality will be observed. All data and consent forms will be stored securely in the office of the supervisor. All data will be shredded 6 years after the study is completed.

What are the costs of participation in the project? (Including time)

There will be no cost to you other than the 45 minutes or so that are needed for the discussion.

Opportunity to consider invitation

Your participation is voluntary. However, this research is important to my study and I will be delighted if you are able to participate.

How do I agree to participate in this research?

You will be required to sign a consent form to participate in this research. However, you will be given some time to consider. If you do agree to take part in the research, please sign the consent form and return it to me in the self-addressed and stamped envelope provided and we can arrange the focus group.

Participant Concerns

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor Professor Leong Yap.

Concerns regarding the conduct of the research should be notified to the Executive Secretary, AUTECH, Madeline Banda, madeline.banda@aut.ac.nz, ph 921 9999 ext 8044.

Researcher Contact Details: Kong Pei Leong, peileong@hotmail.com
ph 021 0394527

Project Supervisor Contact Details: Professor Leong Yap, leong.yap@aut.ac.nz
ph 921 9999 ext 8604.

Approved by the Auckland University of Technology Ethics Committee on:
18 October 2005

AUTECH Reference number: 05/189

Date Information Sheet Produced: 9 September 2005
(Questionnaire)



Project Title

Rethinking Display and Shelving

Invitation

I wish to invite you to participate in this research. I am currently studying for a masters degree in Art and Design at Auckland University of Technology. My research is on designing display shelving systems with aesthetic qualities to elicit audiences' emotional responses.

This is a very important part of my research study. Your opinions and advice are very important contributions to the success of my study. I hope that you are able to assist me by sparing some time to participate in the questionnaire survey.

What is the purpose of the study?

This questionnaire is conducted to seek your opinion on the importance of aesthetics and emotional factors in display shelving design.

How are people chosen to be asked to be part of the study?

Participants will be randomly selected by personal contacts in the streets of Auckland city.

What happens in the study?

I will explain the detail of my research aims to you and ask you to answer thirteen questions relating to the aesthetic aspects of shelving design. These questions will be centred on the aesthetic preferences and emotional aspects of the display shelving design.

What are the benefits?

Your opinion is important to the success of my study. The research findings will enable me to understand emotional needs and wants in furniture design especially display shelves design. Hence, it could benefit designers, retailers and consumers.

How will my privacy be protected?

Confidentiality will be observed. All data and consent forms will be stored securely in the office of the supervisor. All data will be shredded 6 years after the study is completed.

What are the costs of participation in the project? (Including time)

There will be no cost to you other than the 15 minutes or so that are needed for completing the questionnaire.

Opportunity to consider invitation

Your participation is voluntary. However, this research is important to my study and I will be delighted if you are able to participate.

How do I agree to participate in this research?

Your completion of the questionnaire will be taken as indicating consent to participate in this research.

Participant Concerns

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor Professor Leong Yap.

Concerns regarding the conduct of the research should be notified to the Executive Secretary, AUTECH, Madeline Banda, madeline.banda@aut.ac.nz, ph 921 9999 ext 8044.

Researcher Contact Details: Kong Pei Leong, peileong@hotmail.com
ph 021 0394527

Project Supervisor Contact Details: Professor Leong Yap, leong.yap@aut.ac.nz
ph 921 9999 ext 8604.

Approved by the Auckland University of Technology Ethics Committee on:
18 October 2005

AUTECH Reference number: 01/189

Appendix C

Survey Questionnaire (Sample)

Questionnaire

By completing this questionnaire you indicate your consent to participate.

This questionnaire consists of 2 parts:

Part A is designed to gather participants' personal details.

Part B is designed to evaluate the aesthetic qualities of the display shelves.

A. Participant's Details

1. Occupation (optional) _____

2. Gender

- ☐ Male
☐ Female

3. Age Group

- ☐ 20 - 24
☐ 25 - 29
☐ 30 - 34
☐ 35 - 39
☐ 40 - 44
☐ 45 - 49
☐ 50 - 54
☐ 55 or over

4. Ethnic Group

- ☐ Maori
☐ Pakeha
☐ Asian
☐ Pacific Islander
☐ Other (please specify) _____

5. What type of dwelling are you living in?

- ☐ Apartment
☐ Town House
☐ Detached House
☐ Other (please specify) _____

B. Display Shelves Evaluation

1. Please rank 1, 2, 3, 4 and 5 in order of your preference of the following display shelf design.

1 = 1st preference, 2 = 2nd preference, 3 = 3rd preference, 4 = 4th preference and 5 = 5th preference.



Display Shelf A

Clear Acrylic with Suction Cups
(525Lx350Wx355H, 5KG)



Display Shelf B

Clear & Black Acrylic with Suction Cups
(525Lx350Wx355H, 5KG)



Display Shelf C

Black Acrylic with Rubber Buffers
(525Lx350Wx355H, 5KG)



Display Shelf D

White Acrylic with Polyurethane Spikes
(525Lx350Wx355H, 5KG)



Display Shelf E

Clear & White Acrylic with Rubber Mat
(525Lx350Wx355H, 5KG)



This image is included here to show the scale and size of the display shelves only. Not to be evaluated.

2. Please put a tick ☒ below the phrase in each row that best describe your feeling about the display shelf you preferred most. (The one you have just ticked as your first preference in Question 1)

Very Amusing	Amusing	Indifferent	Not Amusing	Not Amusing At All

Very Inspiring	Inspiring	Indifferent	Not Inspiring	Not Inspiring At All

Very Desirable	Desirable	Indifferent	Not Desirable	Not Desirable At All

3. How would you describe the appearance of the five display shelves?

Very Beautiful	Beautiful	Indifferent	Ugly	Very Ugly

4. Which of the display shelves do you feel best reflects your personality?

- ☐ Display Shelf A
 ☐ Display Shelf B
 ☐ Display Shelf C
☐ Display Shelf D
 ☐ Display Shelf E
 ☐ None

5. Please tick **one** other function you would use your display shelf for.

- ☐ Sculpture
 ☐ Space Divider
 ☐ Coffee Table
☐ None of the above
 ☐ Other (please specify) _____

6. Please tick **one** area in your house you would locate this display shelf.

- ☐ Living Area
 ☐ Dining Area
 ☐ Kitchen
☐ Bedroom
 ☐ Study Room
 ☐ Kid's Room
☐ Other (please specify) _____

7. Would you feel proud to own this display shelf?

- ☐ Yes
 ☐ A little
 ☐ No

8. Would you buy this display shelf?

- ☐ Yes
 ☐ May be
 ☐ No

Thank you for taking the time to complete the questionnaire.