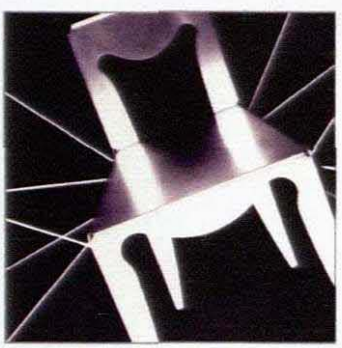

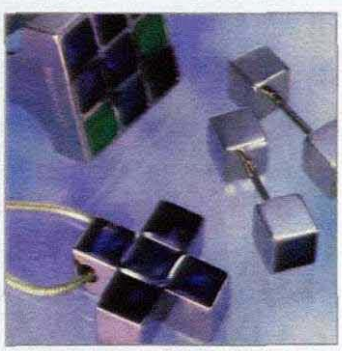

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MTech (Design)

The Effect of Serial Production on Domestic Artefacts & Jewellery

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Submitted in fulfilment of the requirements
for the Magister Technologiae in Design

Departments of Product Design and Jewellery Design
Faculty of the Built Environment and Design
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DECLARATION

I, Veronica Eve Barnes, hereby declare that the contents of this thesis represent my own unaided work, and that the thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

ABSTRACT

This thesis investigates how serial production has influenced the design of artefacts, jewellery and/or domestic products since 1990, with a focus on Italy and South Africa. The study also looks at the roles played by design, technology and serial production in the perceived value of artefacts.

There are fundamental differences in consumer attitudes to serial production in industrial and jewellery design. Handmade jewellery is perceived as more valuable than its mass produced equivalent, whilst mass produced domestic products do not have the same negative association. The motivation of this study is to identify the role played by serial production processes in the perceptions of quality of mass-produced products with the aim of improving the perceived quality of South African jewellery and thus expanding the market.

In order to illustrate how serial production has influenced the design of artefacts, three key areas were researched: the influence of the concept of serial production on the physical forms of artefacts; physical aspects of the serial production processes that have influenced forms of artefacts; and abstract ideas of quality communicated through the process of serial production.

It was found that quality did not appear to be communicated directly through the physical process of serial production. The Italian industrial designers, in particular, seemed to have a well-developed sense of personal design philosophy, which could be developed among South African jewellery designers while they are studying or while they are working in industry. Expectations of the function of jewellery mean that the role of jewellery design is different to that of the product designer. A branding initiative to raise the profile of South African jewellery is recommended. The South African jewellery industry also needs to invest in new production technologies. The establishment of training in the new production technologies, especially rapid prototyping, for jewellery students is seen as imperative.

ACKNOWLEDGEMENTS

I wish to thank all those who have contributed to my design education – it has changed the way I experience the world.

> "True design is never conventional or uninspired... A true work of design must be moving, it must convey feelings, evoke memories, surprise and transgress... it must be able to make us feel more intensely that we are living the only life we've got. In short, it must be poetic."
>
> (Alessi, 2000: 142)

The financial assistance of the National Research Foundation (NRF) towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at, are those of the author and are not necessarily to be attributed to the National Research Foundation.

DEFINITION OF TERMS

Aesthetic preferences: Concerned with beauty or physical appearance of something, be it colour or pattern, for example.

Artefact: An object produced or shaped by human craft, especially a tool, weapon or ornament of archaeological interest is an artefact (Dictionary, 2000). For purposes of this thesis, this definition will include items manufactured by serial production processes, which are human-directed.

Art jewellery: Art can be described as work exhibiting human creative skill (COD, 1990: 60). Art jewellery can then be described as art that employs a jewellery format. The artist might develop a theory to support the work, perhaps to pass social comment or to explore beyond traditional jewellery material and processes. It is thus a form of statement or expression, different in nature to mass produced jewellery, because of its lack of commercial constraints.

Arts and Craft Movement:

The Arts and Crafts Movement was founded in the United Kingdom in the late 19th century. John Ruskin and William Morris abhorred the "dehumanizing aspects of mechanisation and the increasing division of labour in factories" (Raizman, 2003: 66). They advocated a revival of the decorative arts and hand craftsmanship, as well as guild or workshop systems similar to those that operated in the Middle Ages. The Arts and Crafts Movement was also linked to ideas of social reform.

Assigned value: This could be described as a kind of perceived individual expression; one would, for instance, assign value or emotional attachment to something that is mass produced.

CAD: Computer-aided design. The computer is used to aid the design process, and provides precise specifications. Specialist programmes exist for various types of design (e.g. engineering, product design).

CAM: Computer-aided manufacturing.

Craft tradition: The established practice of creating an object, usually requiring skilled artistry and emphasizing hand fabrication.

Dematerialisation: The loss of volume in products, as a result of shrinking electronic components.

Deutsche Werkbund: A group formed in 1907. Muthesius, the founder, advocated "the use of typical, standardised forms" (Raizman, 2003: 181), and tried to repress individuality. The Werkbund attempted to bring together the social concerns of the day, as well as those of the artistic and commercial environments.

Ergonomic and human factors:
Concerned with humans operating in their environment. Can include the study of appropriate heights and sizes of objects within the working environment, for example.

Filigree: Very fine ornamental wirework, usually in copper, silver or gold.

FRIDGE: In 1995 the South African Department of Trade and Industry (DTI) was granted approximately R8.1 million by the Japanese Government for reconstruction and development. This provided the

basis for the Japanese Grant Fund (JGF). The benefits of the research conducted with this funding were such that, when the funds were exhausted in late 1998, the DTI created and funded a new body to continue this work. It was called the Fund for Research into Industrial Development, Growth and Equity (FRIDGE). FRIDGE is used to "fund investigations or studies that aim to: improve competitiveness, be implementable, inject international and local expertise, build individual and institutional capacity among stakeholders, and contribute to collaboration on policy and development issues" (NEDLAC, 2005b). The JGF and FRIDGE had conducted 45 major studies by 2004.

Functionalist: Designed or intended to be practical or perform a task/function (i.e. utilitarian), rather than be attractive.

Human factors: *see* Ergonomic and human factors.

Ideas of environment: Forty (in *Objects of Desire*, 1986) argues that all products embody the social values and ideas of the environment for which they are intended.

Instinctive choice: The action of choosing something subconsciously, for a variety of reasons (cultural conditioning, for example).

Machine aesthetic: The term applied to the "concept of the machine as a source of beauty" (Nele Portal, 2002). This resulted in a style or aesthetic that simulated the "rationalised, standardised forms of machines and factories, often abstracted from any functional or instrumental context" (Nayar, 2005).

Mass customisation: The process of differentiation in a mass production environment, facilitated by increasing flexibility in computer programming. It is

possible to vary two objects within a series without disrupting the production rate.

Miniaturisation: The process of producing an object in a smaller version. As electronic components become smaller and more compact, so many other products become miniaturised.

NEDLAC: The National Economic Development and Labour Council was formed on 18 February 1995. One of NEDLAC's main objectives is to "strive to promote the goals of economic growth, participation in economic decision-making and social equity" (NEDLAC, 2005a). The social partners in NEDLAC are representatives from labour, government, business and the community. NEDLAC conducts research in order to keep up with developments, locally and internationally, in the areas of social and economic policy.

Object psychology: This refers to the study of human behaviour in relation to the objects they encounter.

Product semantics: Product features that have connotations, which suggest function or cultural affiliation.

Serial production: The manufacture of articles by a standardised process in specific quantities.

Technological/Functionalist aesthetic:

Technology is the focus of the designer and is considered a source of beauty. This results in an aesthetic or style, which refers strongly to the standardised forms of machines and mass-produced objects. The style refers to the technological environment, which includes machine tools, robotic missiles, industry and space, as well as the unconventional use of industrial materials.

Utilitarianism: Objects or buildings described as utilitarian are designed to be useful and to have a particular purpose, rather than to be attractive (COD, 1990: 1353). This can be evidenced in plain, unadorned objects or buildings with no additional adornment.

Virtual jewellery: Jewellery that exists only as an electronic model within virtual modelling software – in other words, there is no physical manifestation of the design.

Wiener Werkstätte: Also known as the Vienna Workshops, the group was formed by Josef Hoffmann in 1903. Their aim was to raise the status and improve the quality of the Austrian decorative arts. To this end, the Werkstätte tried to forge bonds between manufacturers and craftsmen (Raizman, 2003: 93).

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1. INTRODUCTION

There is little doubt that the development of mechanised production has profoundly influenced the technical, cultural, social and aesthetic aspects of modern life. It has set up a continuing conflict with regard to perceptions of value between items made in the craft tradition, and those manufactured in a serial production setting. The problem to be investigated here is how serial production has influenced the design of artefacts, jewellery and/or domestic products, since 1990 with a focus on Italy and South Africa. This includes the roles that design, technology and serial production play in the perceived value of artefacts.

When comparing the disciplines of industrial and jewellery design, it becomes apparent that serial production is a key issue in both. The attitudes of jewellery designers, product designers and (to a lesser extent) jewellery consumers to serial production will be discussed and examined. This discussion reveals the motivation for the study, in comparing the performance of the industrial design and jewellery industries in the South African context. The main aim is to increase the export market for South African jewellery. As there appears to be a need to investigate the roles played by design, technology and serial production techniques with regard to the perceived quality of these artefacts (in the form of jewellery and domestic products), the focus of the study is on three key aspects of the influence of serial production on artefacts. These will be discussed later in the chapter, as will the background and methodology of the study.

1.1 The Disciplines of Jewellery and Industrial Design

It seems obvious that the design principles for manufacturing artefacts, items of adornment and domestic products, would have the same point of departure. In the context, then, the disciplines of jewellery and industrial design can be compared with each other.

Jewellery design can be described as the creative process that usually precedes the manufacturing process involved in creating objects for personal adornment. Physical adornment or decoration declares the wearer's ideology, social standing and cultural affiliation. Such objects can also reveal status or chronicle life stages (for example, a necklace for a widow, a Christening bracelet, a wedding ring). They can indicate tribal affiliations (including branded tribal identity) or serve as protection, both physical and psychological. For the purposes of this discussion[1], religious and traditional tribal jewellery are excluded. Central to the investigation is commercial mass-produced jewellery, as well as designer limited production jewellery and art jewellery (see definition of terms).

Industrial design is predominantly concerned with the design of the vast array of goods manufactured by serial or mass-production methods. The task of the industrial designer is to produce a plan or specification of a form or mechanism for production. All objects have been conceived to serve a certain purpose and to embody a particular set of values. Industrial products are, therefore, elements of our material culture, and can be viewed as tangible expressions of individual and social requirements.

Thus far, there has been little or no formal research into the link between jewellery design and industrial design. It could be argued that one of the issues separating the two disciplines is that of serial production. This thesis, then, examines the widely differing attitudes to the production of multiple artefacts within these two disciplines with a view to discovering their common ideologies.

1.2 Attitudes to Serial Production

John Ruskin, founder of the Arts and Crafts Movement (Raizman, 2003: 108) in the late nineteenth century, insisted that artefacts should reveal their man-made origins in order to reflect man's essential humanity. He felt that precisely finished, symmetrical products *like those generated by machine* [author's italics] represented, therefore, a denial of individual expression. Contemporary defenders of this philosophy similarly feel that technology has subverted the quality and status of ornamentation. Factories

can, after all, produce and reproduce decorative objects, many of which deteriorate in quality with each successive generation. Similarly, many contemporary jewellery designers would deem the handmade artefact to be particularly valuable, because of its craftsmanship.[2] Nonetheless, some mass-produced jewellery items are assigned value, by virtue of their role in certain rituals (the mass-produced wedding ring, for example).

The issue of serial production is, however, central to the design process of the industrial designer. A domestic product is designed to be functional, produced in multiples, and available to "the masses" at a relatively affordable price. These products[3] do not seem to carry the same negative associations as do mass-produced items of jewellery. Clearly, there is a need to investigate the roles played by design, technology and serial production techniques in the manufacture of these artefacts, which are imbued with a sense of quality.

1.3 Motivation for the Study

1.3.1 The South African economy

Traditionally, South Africa has been considered a resource-based economy, associated with large-scale mining and agriculture. Over the last 50 years, though, these sectors have declined,[4] and the largest single contributor to the gross domestic product (GDP) is now the manufacturing sector. This sector has grown from 12.1% in 1950 to 19.9% of the GDP in 2000 (Viljoen, 2003). There is increasing pressure on role players in the sector to manufacture goods to replace imports and thereby create employment and opportunities for economic development. Product design is seen as a pivotal value-adding factor to a successful and competitive manufacturing sector. The South African design industry is currently estimated to be worth R3 billion per annum. Although this figure seems high, it is far below the estimated R7.3 – R14.5 billion that is needed for the country to be on a par with international markets, where design represents 1% – 2% of manufacturing output (Viljoen, 2003).

1.3.2 The South African jewellery industry

Whereas South Africa is blessed with many natural mineral resources, it has long been felt that it is far behind the rest of the world in beneficiating its minerals. Although South Africa "provides about 25% of the raw material for jewellery production worldwide, it contributes less than 0.5% to fabricated jewellery" (Hendry, 2001). This means that little value is added to the minerals exported and that opportunities for greater revenue generation are lost in this way. In 2002, according to Lourens (2002), the South African jewellery industry, employed a mere 3,500 people in direct jewellery manufacturing.[5] This industry has the potential to grow tenfold over the next 10 years – which would mean that earnings of $300 million in foreign exchange are possible.

1.3.3 The Italian jewellery industry

One of South Africa's major (i.e. in the top 10) trading partners is Italy. With regard to supplying the well-developed jewellery industry in that country, South African gold represents 50 – 60% of all exports to Italy. The export trade with Italy (including gold) is valued at approximately R17 billion (Anon, 2004). Italy is considered to be a world leader in jewellery design and manufacture, and almost 65% of all Italian jewellery is exported. Its jewellery industry is represented by 12,000 firms (industrial manufacture as well as craft) and 1,000 wholesalers (Danieli, 2004).

While there has been much development in the area of industrial design in South Africa, the jewellery industry has not managed to expand into the export market to the same extent. The mass producers of jewellery in the 9 carat gold market have to compete with both India and Italy on the world market. The labour costs in South Africa mean that they struggle to be competitive. The Italian jewellery industry has managed to maintain a sense of value in the jewellery they produce by using serial production methods, and they are considered world leaders in such production technologies. The stable Italian jewellery industry could provide a role model for developing the South African jewellery industry.[6] An analysis such as the one conducted herein, of their production techniques and technology, as well as the perceived value of their products would benefit the South African jewellery industry. It is important to identify appropriate technology that could be developed for use in the mass produced jewellery

industry, and to investigate the metaphoric communication of ideas in the design, as well as images of quality or *perceived value through technology* in the context of manufacturing, in order to expand the South African jewellery export market and increase mineral beneficiation.

1.4 Focus of the Study

Three key aspects of the influence of serial production have been identified. The first is the way in which the concept of serial production has influenced the form of artefacts, which includes both domestic products and jewellery. The early twentieth century designers of the Modern Movement, like Gropius, Behrens and Breuer, reacted to the idea of mass production out of necessity, as it was rapidly changing the face of their world. Thus began the simplification of the forms of products for production, and Functionalism developed out of this trend. In his work for AEG, Peter Behrens initially focused on developing a "machine aesthetic".[7] In a similar vein, some art jewellers have also developed a "technological aesthetic/styling"[8] as a response to their technologically driven environment.

The second important influence of serial production is the way in which its physical aspects have influenced the forms of artefacts. The technology of serial production includes the use of computer-aided design (CAD) and computer-aided manufacturing (CAM) systems[9] and rapid automated prototyping, as well as casting, laser cutting, electroforming and die forming. These new techniques (for example, precision casting, laser cutting, CAD/CAM prototyping) have allowed for a better finish on many artefacts, and have expanded possibilities in the form of artefacts, particularly in product design.

The third, and perhaps the most significant aspect of the study, is to ascertain what abstract idea of quality is communicated through the physical process of serial production. In other words, is there an intangible quality, which is communicated in the design of domestic products for serial production, that is a purveyor of value, which is lacking in mass produced items of jewellery? What is it that makes a product *desirable*

– that makes us choose it over another? What aspect of industrial design manages to imbue value even though the item is produced en masse and perhaps even by using materials of little value?

1.5 Methodology of the Study

This study utilises a mainly qualitative methodology, since it deals with issues as subjective as *quality*[10] and *value*[11] of products. In addition to conducting a comprehensive literature survey, key information was gleaned from the interviewing process. The literature survey and searches on various databases revealed a number of jewellery designers whose work has been influenced by abstract ideas of serial production in a similar way to that of the "machine aesthetic" of the Modernists (an idea discussed in Chapter 2). The specific works of these designers were then identified and analysed to determine their relevance to this discussion.

Broadly speaking, three groups of people were interviewed: the Italian designers, the South African designers and the South African consumers. Details of the first group, viz. the Italian designers and design companies, are available in Appendix A. The Italian product designers were, with one exception, part of design companies, as opposed to working for companies that manufactured the products themselves. The advantage of interviewing designers working in the design company context is that they usually have clients with diverse design and manufacturing requirements. This facilitates a broad experience. In addition, the designer working in the manufacturing environment of a large furniture design company proved a good point of comparison for attitudes to design and manufacturing. Furthermore, in the instance of the design company Alessi, the author visited the factory and gained an overview of their attitudes and approach to product design, as they employ no in-house designers. As the focus of the study is on serial production, it seemed appropriate that the Italian jewellery designers would be part of the manufacturing context, with one exception. Although this one designer is not involved in production on a large scale, she was nonetheless included in this study because of her unusual approach to jewellery design.

The second group, comprising the South African product designers, were also, with one exception, part of design companies, as opposed to working in companies that manufactured the products themselves. Once again, the product designer who was the exception working in the design and manufacturing environment, provided a useful point of comparison. The jewellery designers were, with one exception, all part of manufacturing environments, but serving different segments of the South African market. The exception provided insight into the top end of the market and a point of comparison with regard to issues of export and scale of manufacture. Details of the South African designers and design companies are available in Appendix B.

The aim of interviewing the third group, namely the South African consumers who formed part of the target market for each of the jewellery manufacturers, was to obtain the feedback of a particular target market. The details of the South African consumers are accessible in Appendix C. The target markets were specified by the South African jewellery companies. Although the sample was small (comprising only five individuals), much information was gleaned from these fairly in-depth interviews. Samples of all the interview guidelines appear in Appendix D. As with all the interviews outlined above, the results were then analysed by content, in order to determine any common responses.

1.6 Structure of the Document

The thesis consists of 5 chapters. This chapter provides the background and framework for this study, by identifying and comparing the different attitudes to serial production, which form a key part of the disciplines of industrial and jewellery design. The fundamental differences in the two approaches of industrial design and jewellery design were identified through primary research, and are reflected by consumer perceptions that handmade jewellery is more valuable than that produced in a factory context, whilst mass produced products have a better perceived value than their jewellery counterparts. The motivation for the study is also discussed, with a view to improving the perceived quality of mass produced South African jewellery and thus expanding the market for such items. The focus of the study identifies three key areas for research: the influence

of the concept of serial production on the forms of artefacts; the physical aspects of the serial production processes that have influenced the actual forms of these artefacts; and the abstract ideas of quality communicated through the process of serial production. A framework for the methodology of this study is also provided in this chapter, while the relevant interview guidelines can be found in Appendix D.

Chapter 2 introduces the first area of focus of the study: the influence of the concept of serial production on the form of artefacts. It begins with the development of Functionalism and a "machine aesthetic", a style or design approach applied to products, even if they weren't going to be mass-produced. This approach has persisted in a way that is understood to mean a logical, ordered approach to design, resulting in artefacts that are free from additional ornamentation and honest in their use of materials (which include "industrial" materials manufactured on a large scale). As one explores the effect of these ideas, the work of a group of jewellers is discussed. Their "technological/functionalist aesthetic" is analysed, and the examples are illustrated towards the end of the chapter.

The key issue in Chapter 3 is how the physical aspects of the serial production process have influenced the actual forms of artefacts. Although there were initially many constraints in the production processes of mass manufacture of goods, developments in the technologies of mass manufacture has resulted in greater freedom and choice in form and materials. The development of CAD/CAM technologies has played a significant role in the evolution of form in domestic products, and thus this issue is discussed herein. The views of Italian and South African product designers (whose details are outlined in Appendix A and B) are examined and interpreted to highlight the importance of such technologies in the field of industrial design. In the South African jewellery design context, the industry has thus far been slow to embrace the new technologies. Italy, in contrast, is a world leader in these technologies. Some technological pioneers are discussed in this context, lauded for their sense of exploring the boundaries of serial production technologies. It is found that the serial production process has an effect on jewellery internationally, and the role new technologies should play in the South African context is explored in a NEDLAC study. The potential

limitations of these technologies are also discussed in interviews with Italian and South African designers later in the chapter. A brief outline of the actual technologies discussed can be found in Appendix E.

The issue of whether quality is communicated through serial production is perhaps the most important one of the study. The factors influencing product choice are accordingly examined in Chapter 4 with a view to discovering the role played by serial production processes in the perceptions of quality of mass produced products. These include the perceived individual expression of assigned value. Aesthetic preferences, social/cultural filters, visual symbolism and colour and product semantics[12] are all examined within the area of instinctive choice. Functionality, which has a more obvious link to the serial production process, is also discussed, along with the tactility of the artefact. The ideas of environment,[13] or choosing a product on the basis of the assumptions or ideas behind the product, are examined. The concept of "object psychology"[14] is discussed under the umbrella of spiritual importance, which is an essential design consideration of the Italian company Alessi. The issue of branding is considered in the light of mass production and the relevant theories relating to quality assurance. Finally, the methods of serial production are discussed as a factor influencing product choice in both the jewellery and domestic product context. The consumers interviewed in this regard held specific views about the importance of the method of production, and how these reflect an idea of quality, especially in jewellery.

Finally, Chapter 5 reflects upon and summarises the research conducted herein into the effects of mass production on the forms of artefacts. Both the physical effects and the conceptual effects of the concept of serial production are discussed here. Perceptions of quality relating to the production technologies are also investigated and evaluated, and some recommendations are made. These are recommendations for the South African jewellery industry, the higher education environment and also for further study into this particular area of research.

[1] This study thus excludes the contemporary phenomenon of brand "tribal affiliation".

[2] Although it is accepted that not all handmade jewellery *is* finely crafted, it is a common expectation.

[3] From this point onward, the term 'product' will be assumed to mean *domestic* product.

[4] The mining sector's share of the GDP has declined from 14.3% in 1950 to 5.9% in 2000, and the agricultural sector has declined from 7.2% to 4.4% (Viljoen, 2005).

[5] In 2002, the South African jewellery industry employed 9,000 people in retailing jewellery concerns and 3,500 in related industries (Lourens, 2002).

[6] Although the Italians draw on many generations of traditional jewellers and a design heritage, they are also world leaders in jewellery production techniques and technologies. These techniques and technologies are therefore accessible to and applicable for the South African jewellery industry.

[7] See definition of terms.

[8] See definition of terms.

[9] See definition of terms.

[10]

2. INFLUENCE OF THE CONCEPT OF SERIAL PRODUCTION ON ARTEFACTS

The concept of serial production[1] has played a role in determining the forms of artefacts since the end of the nineteenth century. At this time, functionalism developed, based on the design requirements for the serial production environment; some of the key designers of that era are discussed here. While a functionalist approach had already been evident previously (exemplified by the utilitarianism seen in architecture), it was the first time that real physical constraints were made on the design approach as a direct result of the serial production processes, materials and machinery.

The effect of the concept of serial production becomes apparent as functionalism is discussed as an *approach* to technologically driven design. Functionalism is even known as a "machine aesthetic" (Sparke in Raizman, 2003: 166) – a form of styling, not necessarily related to serial production at all. Even as the physical constraints of serial production fall away with the advent of microelectronics, it is the concept of serial production that remains an influence on the form of the artefacts. This is also evidenced in the "technological/functionalist" aesthetic of some jewellers who are discussed in this chapter. Their diverse approaches to design are united by the common key influences of technologies and production processes, in that all artists comment to some extent on mass production processes, in addition to using materials in experimental ways. Examples of this kind of work are included later in the chapter to illustrate the influence that the concept of serial production has had on the forms of artefacts.

2.1 Development of Functionalism

There is no denying that mass production is one of the things that distinguish our century from all preceding centuries (Pevsner, 1968: 7). Not only has mass production created the concept of the consumer, but it also continues to revolutionise the life of such a consumer as technologies evolve and become more sophisticated and complex.

Ours has become an industrial society, where people are surrounded by the products of mass manufacture and the effects of these technologies.

Although one can trace writings that point to a functionalist approach to Hellenistic architecture as far back as the first century BC to the Roman architect, Vitruvius, this concept has been revived many times, particularly as an approach to architecture. The start of twentieth century functionalism, for instance, is often laid at the door of American architect, Louis Sullivan, who coined the phrase "Form follows function" in 1896.

The German architect, Hermann Muthesius, was also a pioneer of functionalism, drawing his response directly from the industry he saw around him. Whitford (1984: 20) writes that Muthesius wanted objects that "expressed the qualities of the materials in which they were made, were free from unnecessary ornament and could be afforded by the broad mass of the public." He was an advocate of the irreconcilability of ornament and mechanised production. It is therefore not surprising that he became the founder of the Deutsche Werkbund (a coalition of 12 artists and 12 industrialists in Germany) in 1907, to encourage the employment of designers in the industrial workplace. His expectation of machine production was that it would be a "smooth form reduced to its essential function" (Whitford, 1984: 20).

Woodham (1997: 25) suggests that in the early phases of the Wiener Werkstätte (a design workshop founded in Vienna in 1903), the forms were simple and rectilinear, but that this was a superficial echo of early German concerns for the standardisation of forms – and was in fact more significant for its conceptual importance, rather than for the actual compatibility with the concerns of modern industrial production. Peter Behrens, similarly, contributed to a new approach to product design. He began working for AEG in 1907, with his aim being to improve and co-ordinate the visual appearance of the company's products and facilities. As he had been trained as an architect, however, and not as a product designer, Behrens could not rely only on his accumulated architectural knowledge, but rather had to develop something new. His idea of focusing on a "machine aesthetic" was considered visionary. The assumption was that this new

industrial aesthetic "would reconcile the presumed technical functionality of a machine produced object with the human desire for beauty" (Zaccai in Buchanan et al, 1995: 7).

Walter Gropius (1883 – 1969) also played a key role in the revolution in design thinking that occured at the dawn of the new century. He became aware of the gulf between the idealism and reality in the fields of art, architecture and design. He realised that a new attitude was needed among designers and architects, one that incorporated the reality of engineering and technology. This was his vision as the first director of the *Staatliches Bauhaus* in Weimar (Germany).

> Thus the Bauhaus was inaugurated in 1919 with the specific object of realising a modern architectonic art, which like human nature was meant to be all embracing in its scope. It deliberately concentrated primarily on what has become a work of imperative urgency – averting mankind's enslavement by the machine by saving the mass-product and the home from mechanical anarchy and restoring them to purpose, sense and life. This means evolving goods and buildings specifically designed for industrial production. Our object was to eliminate the drawbacks of the machine without sacrificing any of its real advantages. We aimed at realising standards of excellence, not creating transient novelties. (Gropius, cited in Buchanan, 1995: 35)

Despite trying to move toward realism in design, designers such as Walter Gropius and Marcel Breuer still had a very idealistic view of mass production, and even coined the phrase, "precious through precision". They maintained that "objects made to be used should be simple, honest, be well adapted to their purpose, bare of ornament, standardised, machine-made, reasonably priced and expressive of structure and materials" (Metcalfe, 1996: 6). Marcel Breuer, Mies van der Rohe and Le Corbusier were among the designers who saw functional potential in so-called 'industrial' materials. Thus they experimented with materials like tubular steel, which they saw as a means to achieve their machine aesthetic. By 1925, a limited company had been created to market and retail the designs of the Bauhaus, and there was even a catalogue of these designs. The school celebrated functional design that suggested that the object had been machine-made, even though many of the items were not suitable for industrial

production and had in fact been handmade; it is probably for this reason that the venture ultimately did not do as well as expected.

Functionalism in its early phases merely indicated an approach to design that was technologically driven, with the emphasis on the logic of the manufacturing method as the basis of the design process. The machine aesthetic that was so consciously adopted by many, was an embodiment of this consideration for technological manufacture. It resulted in simplified, clean, uncluttered forms and an absence of non-functional parts and ornament. The form was a shell that enclosed the working parts of the product. It was moreover important to choose the material carefully, as it had to be clean, hygienic and affordable, and used in an honest way. This approach to design was increasingly linked to the look of modernity.

As a result, Marcus (1995) writes that functionalism remained without allegiance to style or medium until the 1930s, when it became narrowed by its close identification with industrial austerity and materials, and was simply redefined as a Modernist style. However, Whitford (1984: 200) suggests that functionalism has been falsely thought to have originated in the Bauhaus, and that the "functional" form is now seen as a separate aesthetic – just as much as any other consciously imposed style. The functional object would bear the traits of emphasis on simplicity and a lack of superficial decoration.

Functionalism gave rise to the "black box" styling of the late 1970s and 1980s industrial products, as a result of which items became more and more "technological" in appearance. There were lights, buttons and dials positioned in a controlled manner, on what were usually black or dark grey aluminium or plastic casings. This was intended to emphasise the technological importance of the contents of the casings, whilst generally maintaining a minimalist look.

Functionalism is an approach to design that continues to be used in the design of products for mass manufacture. The world of products with electrical or computer chip components has reached a new turning point, though. Gros, in *Industry or Art?* (1988: 169), suggests a revolution in approach to the design of any product

incorporating microelectronics. His view is that the world of microelectronics, which are continually shrinking and dematerialising, means that designers cannot apply the old rules of honest design. Gros writes that, "it is no longer necessary to reflect the function... The external form is no longer treated as a transparent covering but as a screen onto which metaphorical interpretations of invisible technology can be projected" (1988: 169). The designer needs to employ product semantics to create or suggest function in the form, which houses an increasingly small and faceless technology. Designers have come almost full circle – they are deciding what the product should project, regardless of the internal working parts of the product, which are often too small to consider.

2.2 "Functionalist/Technological Aesthetic"

The primary function of jewellery is physical adornment and associated indications of ideology or status, for example. It is an important medium that facilitates the visual communication of messages. From the above discussion, it is evident that the concept of serial production can influence the form of artefacts. Some jewellers have developed a "technological aesthetic", in much the same way as Behrens' "machine aesthetic". These art jewellers have all created jewellery pieces as artefacts that reflect our technological society, although they are not mass-produced items. Similar to the way in which Functionalism developed a different approach to product design in the machine age of the early 1900's, so a certain visual language has developed to suggest the environment from which these pieces originate.

The jewellers in this chapter use mass produced objects as references, as well as applying a functionalist approach to styling in many cases. Metcalfe (1996: 6) writes of the functionalist approach that "objects made to be used should be simple... honest, bare of ornament, standardised... and expressive of structure and materials". This approach reflects how the concept of serial production has influenced artefacts. Consequently, the jewellery designs examined here emphasise crisp lines, clean, simple forms and a lack of complex detailing. They also do not hide their joining methods, such as repeated rivets, bolts or other clasps (reminiscent of those used to hold together

an aeroplane, ship, or building) if their materials cannot be soldered together. Many of them thus feature materials that may be used in mass production processes, such as acrylic, stainless steel and aluminium, as opposed to the traditional "precious" metals like silver and gold. This also recalls the experimentation of the Modernists Van der Rohe, Breuer and Le Corbusier, who saw the potential in the creative use of industrial materials. They began working with these new materials, including tubular steel (which was readily available at the time because of the new mass production processes), and revolutionised product design. The jewellers discussed herein also adopted a logical, rational approach to their work. The concept of the manufacturing method is the point of emphasis used as the basis for many of these artists' design processes.

By definition, art jewellery[2] is concerned with theories and concepts. It is therefore appropriate that the discussion of the influence of the concept of serial production should focus on art jewellery. Art jewellery comments to the public on societal issues or experimentation with materials, via journals, the Internet or other media. These concepts or principles, or the innovative use of materials or technologies often filter down, and find more commercial applications.[3] Some of the jewellers discussed here do indeed manufacture their jewellery in multiples. While many of the jewellers and metalsmiths mentioned herein are based in the United States, this is primarily because of a lack of documentation available about other areas of the world. The quarterly journal *Metalsmith*[4] (published by the Society of North American Goldsmiths) provides an excellent insight into developments in the field of art jewellery.

The work of designers such as Zack Peabody (USA), who uses mass-produced items as the inspiration for his

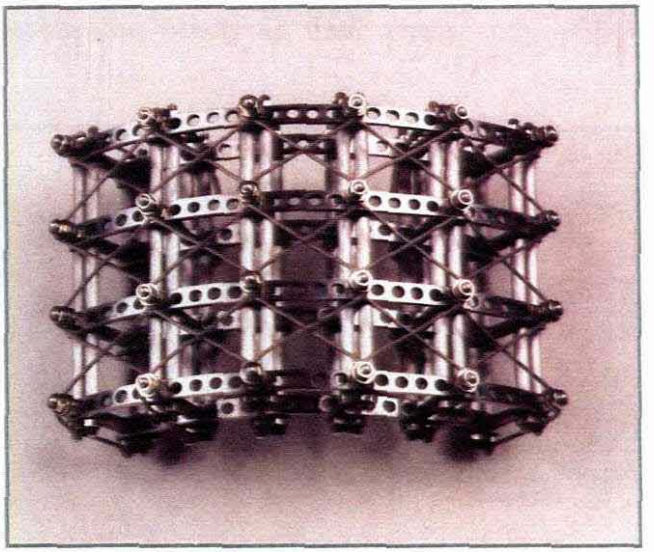

Figure 2.1. *Brooch 348*. Zack Peabody: 1993.

work, is an example of jewellery whose form has been influenced by the ideas of serial production. He writes in *Metalsmith* (1998: 33) about his use of industrial and repetitive referents, categorising them as the "unseen", meaning that which is in plain sight yet not sociologically indicated for aesthetic consideration (for example, machine parts, skyscrapers, towers and scaffolding). His references were often designed to be purely functional, and his aim is to express this unrecognised form of beauty in his work. Industrial materials such as stainless steel or aluminium contribute to the clean, functional feel of his work (Figures 2.1 and 2.2). The approach is direct, in that all (mass-produced) bolts or screws are in plain sight in these constructions.

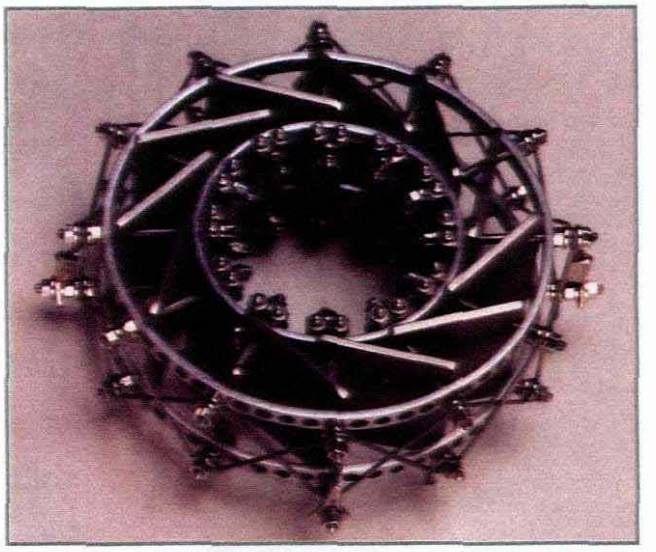

Figure 2.2. *Brooch 534*. Zack Peabody: 1993.

In a similar vein, Kuhn discusses the work of Lisa Gralnick (USA) in *Metalsmith* (1992: 19). Kuhn suggests that Gralnick's goal is to allow the wearer to recognise the essential mechanisms around him or her, and to appreciate the beauty in their forms and functioning. Gralnick's investigations into the ways in which objects function within the cultures that have produced them, led her to search for forms and materials that were relevant to her own context.

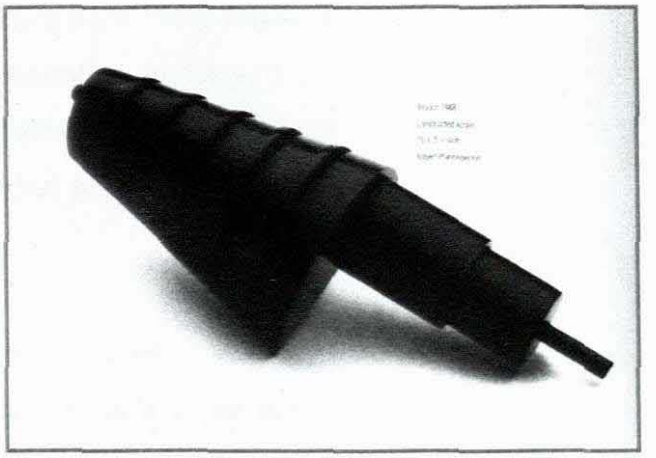

Figure 2.3. *Brooch*. Lisa Gralnick: 1988

Her first mechanism for this was to explore the "quintessentially cheap", mass produced, contemporary

material: plastic. She used the matte black surfaces to maintain the focus on form, without the distraction of colour or gloss, and to keep away from traditional jewellery finishes. Her well-known black acrylic jewellery was large and bulky with a somewhat ominous result, as their original inspiration was submarines and missiles, expressing a distinctive "industrial aesthetic" (Figure 2.3). Drutt (1995: 71) suggests that these black objects seem to reflect the "black box" approach to industrial design of the 1980's, which hide how these machines work. Much mechanical movement in modern[5] machines is not "mechanical", but is instead electronic. These functions have been revolutionised by the development of the microchip, but have simultaneously become a mystery, as it is no longer 'as obvious as clockwork', so to speak, how they function.

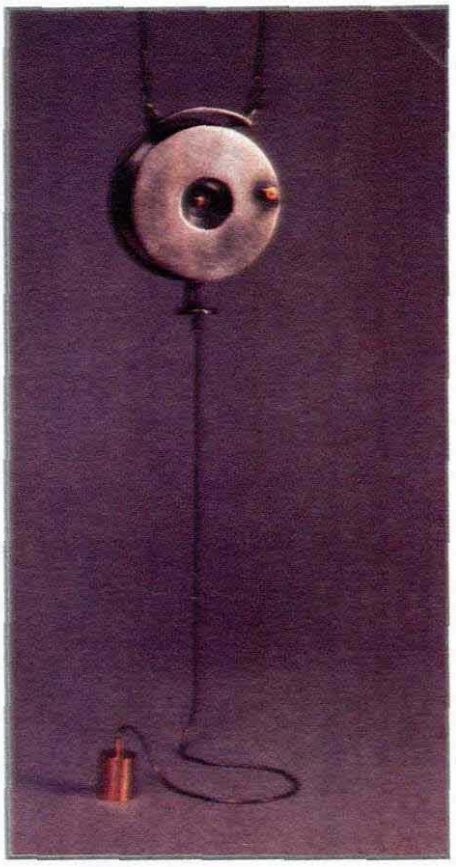

Figure 2.4. *Anti-gravity neckpiece #6.* Lisa Gralnick: c.1992

Gralnick bases her new work on fragments from industry and space, although she does use the more traditional materials of gold and silver. She gives gold and silver an industrial look, whilst exploring the visual potential of simple mechanisms in her "Anti-gravity neckpieces" (Figure 2.4). With their starting point being functional mechanisms and objects, the pieces are uncluttered and controlled in form, and have a matte, unpolished finish. Gralnick remains true to her "ideal that preciousness should inhere in the object itself, not what it is made of. This ideal is part of her continued search for beauty in unexpected places" (Kuhn, 1996: 19).

Dutch jeweller Abrasha describes his own work as "industrial, cool and machinelike" (Krupenia 1997: 29). Unlike Lisa Gralnick in her early work, Abrasha has always included precious materials but he also includes stainless steel, and uses rivets to join any materials that cannot be soldered (Figures 2.5 and 2.6). These rivets

Figure 2.5. *Ring.* Abrasha: c.1996

Figure2.6. *Bracelet.* Abrasha: c.1996

have in some respect become part of his signature, and help to embody the typical industrial look of his works. He feels that they are part of following the Bauhaus maxim that "form should follow function", which he identifies as a key influence on his approach to design. He also uses fairly rigid geometric shapes, cones, circles and squares (Figure 2.7). Although he starts the design process with drawings, he uses the computer to create swift variations of scale, measurement and proportion. His designs are restrained and controlled, partly because he designs with the aim of producing multiples of the pieces, and must consider ease of machining, casting and assembly.

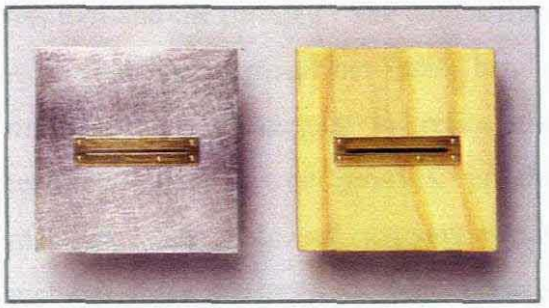

Figure 2.7. *Pins #5 and #6.* Abrasha: c.1996

Boris Bally (USA) also uses traditional precious jewellery materials (such as silver and gold), alongside other mass produced industrial materials, such as stainless steel and anodised aluminium. Having started with a youthful fascination with weaponry, and then moving into the field of industrial design, Bally draws on a vast visual vocabulary. He, like Gralnick and Peabody, begins with functional forms – in this case, discarded robotic parts and machinery. His work is

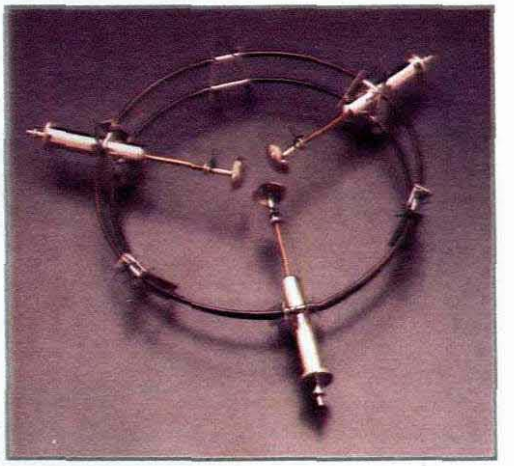

Figure 2.8. *Constrictor.* Boris Bally: c.1990

constructed with machinelike precision, flawless finishing, and often intricate but ordered structure. *Constrictor*, an arm form (Figure 2.8), is a complex circular fabrication, with an almost menacing look of high technology. The piece consists of "three syringe structures that press against the arm, like the clamps of a delicate vice" (Watkins 1993: 72). As with many of Bally's works, it has the overall look of a precision machine.

Machine tool technology is an even more direct referent for Amy Anthony (USA), who has tool-and-die training. She begins the design process with the marks of the machine – be it a milling machine, lathe, band saw or a router. She then uses traditional metalsmithing techniques to refine the textures, scratches or grooves in the material. Her choice of material, which includes mass produced aluminium, steel and plastic, also contributes to her machine aesthetic. Her pieces are the embodiment of machine precision and rigidly controlled forms. Even her palette is restricted, and limited to the subdued colours of the natural materials (Figures 2.9 to 2.12). She steers away from the

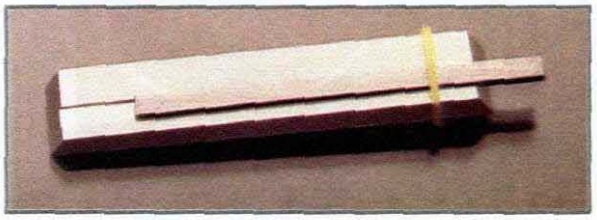

Figure 2.9. *Brooch*. Amy Anthony: c.1996

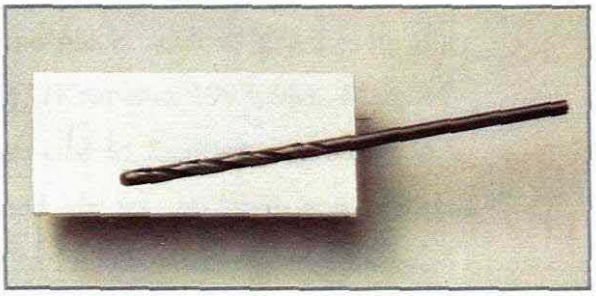

Figure 2.10. *Brooch*. Amy Anthony: c.1996

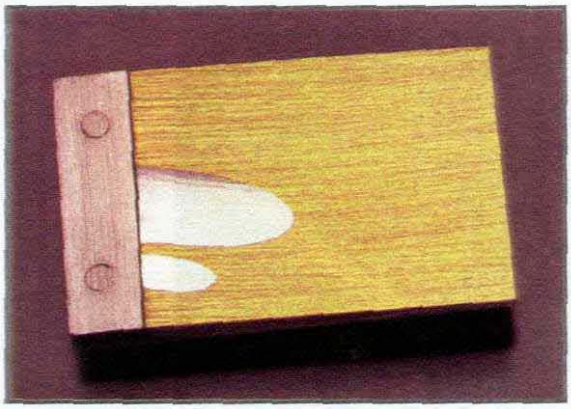

Figure 2.11. *Brooch*. Amy Anthony: c.1996

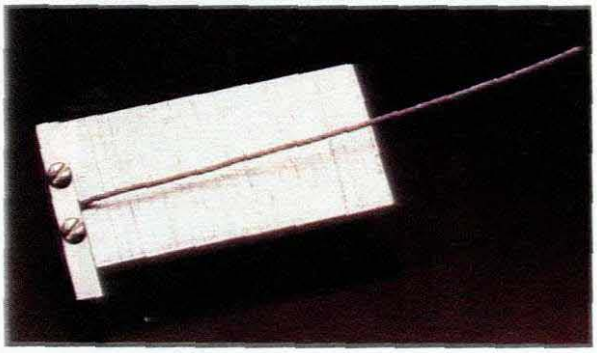

Figure 2.12. *Brooch*. Amy Anthony: c.1996

highly polished finish of the jewellery tradition, and most often uses a matte finish. There are occasional flashes of colour because of the use of anodised aluminium, and more recently in her experiments with plastic. Her more recent pieces expand her use of tools to include computerised numerical control (CNC) equipment, which would allow her choices in surface texture to be predetermined. Being a production jeweller, this facilitates the easy reproduction of her pieces, which she regards as three-dimensional drawings.

Figure 2.13. *Bracelets.* Boo Poulin: c.1996

Plastic, aluminium and rubber were the materials of choice for production jeweller Boo Poulin (USA). She began her career with a series of stainless steel and tape pins. Although she has returned in some respects to the more traditional jewellery materials in the form of silver, she combines this with the mass-produced industrial materials of steel cable and plastic. Poulin says that she collects "materials that I find suggestive: rusted metal parts, hardware store paraphernalia, or even machine piece, such as gears – in other words, whatever I might find that attracts me visually" (Krupenia, 1997: 98). Many of her pieces are restrained in design because they are cast to facilitate reproduction in multiples. Machinelike precision, simple contained shapes, textured and oxidised surfaces, heavy chains and steel cables (Figures 2.13 to 2.15) characterise her pieces.

Figure 2.14. *Bracelet.* Boo Poulin: c.1996
c.1996

Figure 2.15. *Necklace.* Boo Poulin:

Figure 2.16. *Ring*. George Bunz: c.2000

Another designer to feel the allure of non-traditional materials is German designer George Bunz. He challenges the traditional hierarchy of precious materials, by choosing to combine rubber with platinum and gold. The result is what he calls "materials in an interesting symbiosis. New orientations, new perspectives, new movements:..." (Eich, 2001: 28). The rings are mostly rubber (machined and perfectly finished) with small insets of gold or platinum (as seen in Figure 2.16).

Marion Heilig (Germany) is another designer who rejects the traditional jewellery perceptions of materials. Like the other designers mentioned above, even though she uses non-traditional materials, she has maintained a very controlled, precise aesthetic. Her chains, manufactured from various materials, have smooth planes and precision edges. Although it seems that the influences on these works are architectural, the angles chosen on each component to create varying structures are not unlike the

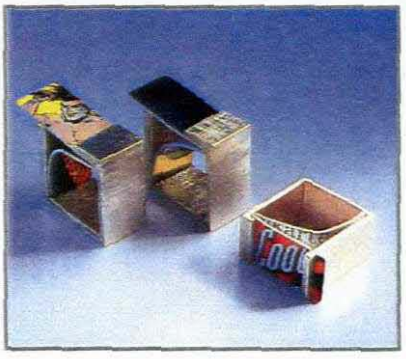

Figure 2.17. *Telephone Card Rings*. Marion Heilig: 2000

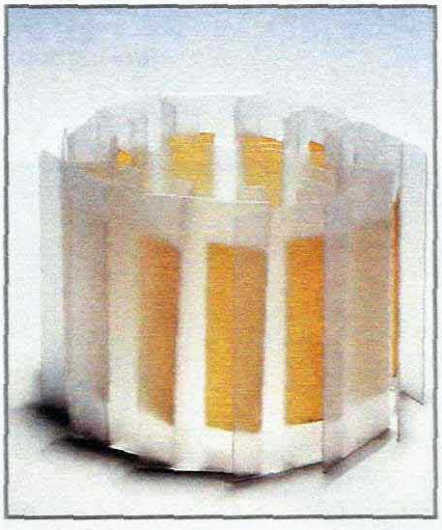

Figure 2.18. *"Elizabeth" bracelet*. Marion Heilig: 2001

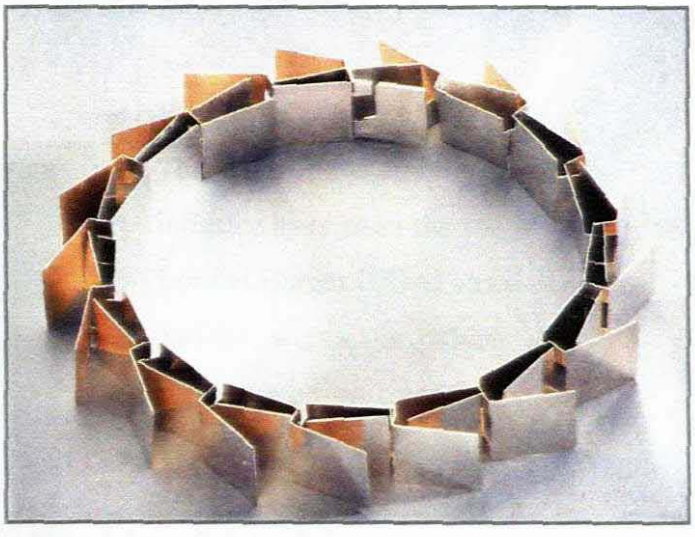

Figure 2.19. *"Ornament" collier*. Marion Heilig: 1997

makeup of conveyor belts used in a mass production setting (Figure 2.18 and 2.19). Heilig rejects rivets and soldering as joining techniques, dismissing them as "artificial" (Wiederspohn 2001: 103), and has instead developed her own system of insertion techniques, which add to the intrigue of her pieces. Heilig uses materials such as telephone cards, plastic and cold drink can metals (Figure 2.17). Some pieces even focus on the inlaid silicone chips as the detail, thus demonstrating how technology can play a decorative non-functional role. Pieces like "Ornament" (Figure 2.19) have a small quantity of gold, which is only visible indirectly in the reflections of the inner surfaces. Newer works (2001), like the "Beta-K" collier and the "Elizabeth" bracelet (Figure 2.18), see her using a new material, Makrolon, which is plastic in combination with gold leaf. Although the effect is a softer one than that of some previous items, because of the milky white plastic, it is no less engineered or machined in structure.

Figure 2.20. *Immaginazione*. George Chiarcos: 2000

Giorgio Chiarcos (Italy), too, makes use of non-precious materials and combines them with gold and silver. He feels the need to enhance the value of recycled materials, such as metal cans, gauze, aluminium, steel and glass, which he "rescues from everyday life" (Bellavista, 2001: 104). Works such as "Immaginazione" (Figure 2.20) do, perhaps, have a heavier, more industrial feel than the works of Amy Anthony, but the use of materials is similarly well thought-out.

Figure 2.21. *Necklace*. Lorelei Hamm: c.1996

Themes of technology and industry have been the focus of Lorelei Hamm (USA) since her earliest works, in which she concentrated on materials such as rubber, acrylic and nobium. More recently, she has been

exploring the combination of organic and industrial forms while maintaining her "machined" finish and avoiding the traditional polished jewellery finish (Figure 2.21). Hamm furthermore uses what she has identified as industrial and cultural symbols that play a role in everyone's lives. By combining geometric and hard-edged shapes with organic ones, she seeks to create a balance between them. She thus prefers to stay with the natural hues of the metal, rather than using other forms of surface finishes or coatings. Being a production jeweller, Hamm makes use of hollow-forming and casting techniques, as illustrated in Figures 2.22 and 2.23. Krupenia (1997: 49) suggests that Hamm's works are "powerful amulets, artefacts of an industrial age".

Figure 2.22. *Necklace.* Lorelei Hamm: c.1996

Figure 2.23. *Necklace.* Lorelei Hamm: c.1996

The work of Susan Cohn (Australia) focuses on portable technology. It is easy to see the link between jewellery and an increasingly portable and wearable technology, so she began by exploring personal stereos and portable telephones. She reflects that this is just the beginning of a world of visual

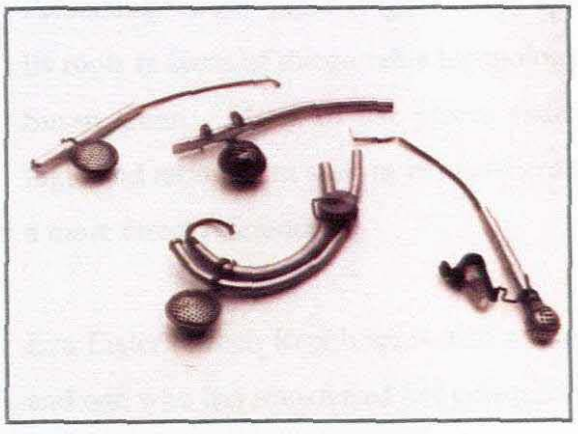

Figure 2.24. *Models for the series "...and Does it work?"* Susan Cohn: 1990

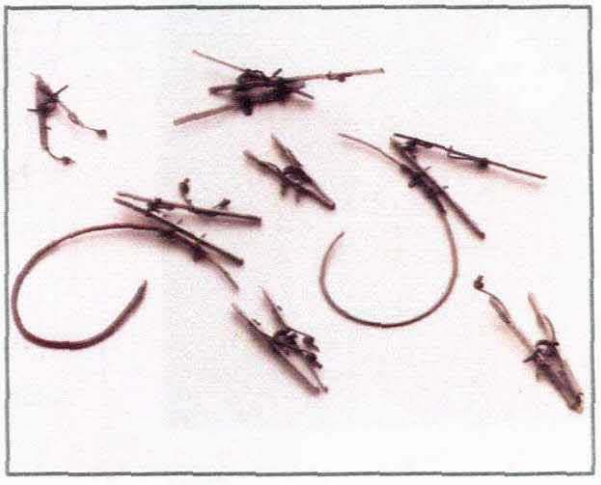

Figure 2.25. *Models for the series Cosmic Manipulations.* Susan Cohn: 1992

Figure 2.26. *Signs of Personality bodypiece.*
Deganit Schocken: 1990

language available to artists. Her series "...and does it work?" (Figure 2.24) plays on the irony of using the visual language of the technology, but discarding the function. The microphones look functional, but almost appear dated, as the world has since seen the development of smaller and smaller functional hands-free devices. In the "Cosmic Manipulations" series (Figure 2.25), she has based her work on small surgical devices, again choosing to look to technology as the visual starting point for her work.

Deganit Schocken (Israel) views her own work as small "linear machines" (Drutt, 1995: 69). Her training as an architect is significant in terms of her disciplined approach to her work, and her attention to detail in terms of construction. These pieces often have an element of adjustability or movement. Her necklaces, for example, can be adjusted in the same way that chains function mechanically, like mountain climbing ropes, and some pieces can be reassembled or altered. Her "Signs of Personality" body piece (Figure 2.26) appears to have its roots in some of the portable technology explored by Susan Cohn. Many of her pieces indicate the tight logic and rationalism seen in items where technology is a more direct reference.

Eva Eisler (Czech Republic) is also a trained architect, and one who has transferred her constructivist aesthetic

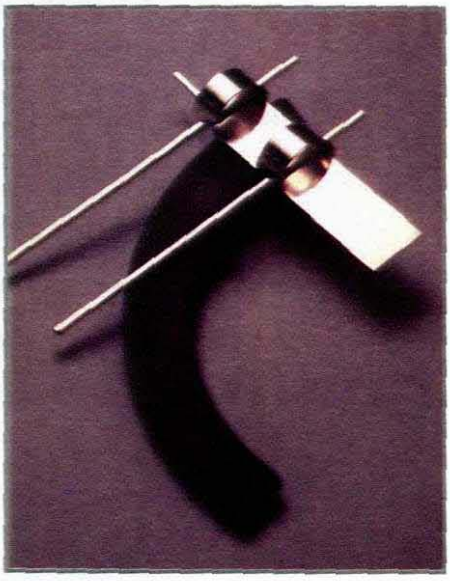

Figure 2.27. *Tension Series V Brooch.*
Eva Eisler: 1992

to her jewellery. Her work reflects her concern for our relationship to technology and our environment. Her aim to work with a level of order, logic and simplicity is reflected in her commitment to geometric shapes and tightly controlled forms. Many of her works are held together in a state of tension, a combination of planar and linear forms. There are often elements of repetition, as seen in construction techniques of buildings. Her series "Tensions" (Figures 2.27 and 2.28) includes materials such as slate, mass-produced mild steel and stainless steel in combination with silver. Her works appear machined in finish, and are often a combination of brushed and polished surfaces.

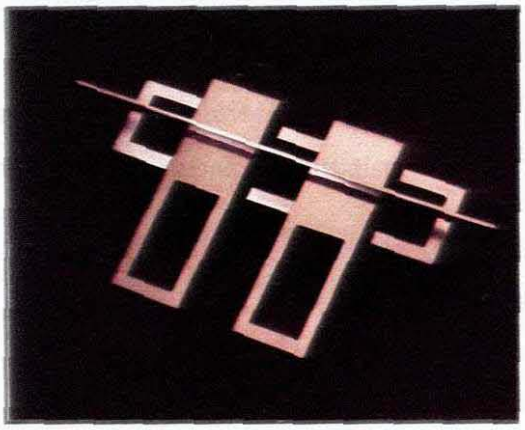

Figure 2.28. *Tension Series II Brooch.* Eva Eisler: 1990

To conclude this chapter, it is clear that twentieth century functionalism was born directly as a result of the advent of serial production, new processes and new materials. The effect of the concept of serial production became apparent, as products soon developed a machine aesthetic even though they would not be mass-produced. The further effect of this can be seen in the work of some art jewellers, whose works were discussed above, where a technological aesthetic is evident. By-products of the serial production process serve as referents for designers such as Peabody, Cohn and Gralnick. The crisp, clean lines and lack of detailing also illustrate a functionalist approach, as seen in the work of Abrasha, Heilig and Eisler, for example. Designers such as Bally and Peabody also illustrate an honest expression of joining methods, such as the use of rivets or bolts. Most of the jewellers discussed in this chapter have used materials commonly employed in the mass production processes, such as plastic, aluminium sheet and stainless steel, thereby extending the effect of the ideas of serial production into their artefacts.

The serial production process has had an impact on every aspect of our lives, as we live in an evermore technology-driven society. The work discussed here is but a sample of

the ways in which technology has influenced artefacts produced in our time in a metaphorical way. These designers have developed their vision of the technological aesthetic in response to this type of environment. In some instances, these designers are then able to use this to their advantage, as they consider certain techniques for the limited production of some of their pieces. A logical, simple and considered piece, lacking in extraneous decoration, is an easier artefact to reproduce. Therefore, in some respects they have created a functional aesthetic, which not only comments on, but also accommodates, the requirements of our technological environment.

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[1] See definition of terms.

[2] See definition of terms.

[3] In a similar way, the ramp fashion collections are diluted and adjusted for a much larger and more commercial clothing market.

[4] The magazine was founded in 1980, and is the only publication in the USA devoted to exploring the metal arts. Part of its mission statement is that "editorial content will emphasise contemporary activities and ideas" in the field. Contributors cover many aspects including status of craft, education and fashion-related issues (Society of North American Goldsmiths, 2005).

[5] Drutt has used this term to indicate contemporary machines, not those belonging to the Modern Movement.

3. PHYSICAL EFFECTS OF SERIAL PRODUCTION ON ARTEFACTS

The advent of mass production at the end of the nineteenth century revolutionised most domestic products, not only in terms of their physical form, but also in the use of materials, which later became available because of mass manufacture techniques. A design for a new product thus needed to take into account and facilitate manufacture by machines of a certain size and capacity, and this is where the first physical effects of serial production can be seen. As these technologies progressed, there has been an increasing freedom in the forms and functions of products. The development of CAD/CAM technologies[1] has played a particularly important role in this respect, and the original idealistic vision of its function is discussed in the context of the domestic product. There seem to be an unlimited number of aesthetic options for product designers as a result of this freedom. Mass customisation is also discussed, as a reaction to the repetitiveness of mass produced products. Perhaps the major effect of serial production on the form of artefacts at this stage is that it limits the creativity of the designer in terms of cost or scale. Several designers interviewed expressed their views on this subject, and their views are discussed below.

The application of new technologies, such as rapid prototyping, is "relatively new to the jewellery industry" (Oroafrica, 2003). However, the major effects of serial production on the form of artefacts appear to be in the freedom of form, as well as the availability of new materials. The works of some technological pioneers, who have used the techniques of lasercutting, stereolithography and virtual jewellery, are discussed in this chapter. These jewellers were free to explore materials and processes, and these techniques often found a more commercial application later. The National Economic Development and Labour Council (NEDLAC)[2] in co-operation with the Fund for Research into Industrial Development, Growth and Equity (FRIDGE)[3] initiated a research project in South Africa between October 2000 and June 2001. Its aim was to improve the performance of South African jewellery on the international market, and the role of the new technologies is considered in this context. The current situation in

international centres of jewellery production is compared with the situation in South Africa, and recommendations are made in this regard. Later in this chapter, the various opinions of interviewees on the subject of serial production technologies are expressed, to illustrate different approaches to incorporating technologies in functioning jewellery businesses. The specific technologies mentioned herein are briefly explained in Appendix E.

3.1 General View of Domestic Products

The newly developed technologies, such as computer-aided design, robotics and information technology, have become significant factors affecting design. New serial production techniques have facilitated a better finish to many artefacts, and have broadened possibilities in the forms of artefacts, particularly in the design of domestic products. As the development of software to support CAD/CAM systems accelerates, it becomes more affordable for many more people. This also means that the use of these systems is no longer limited to large-scale applications like automotive design, but that it permeates the manufacture of all types of products, such as toothbrushes, for example. The effect of the serial production process is therefore visible in the forms of all kinds of products.

Zeitoun (De Noblet, 1993: 374) describes an idealistic vision of the CAD system as a sophisticated tool that would transfer information to a manufacturing system or machine, which would eliminate all problems. Ideally, products would be designed in the best possible conditions; and the system would enable the designer to visualise, control and specify every aspect of the new product. This would then result in increased productivity, because of an increase in working and manufacturing speed; an increase in creativity, because there was time and space for more experimentation with the design; and the birth of truly global products, because the computer is an environment with no cultural boundaries. This vision is certainly a noble one, and whereas originally this system was merely meant to form part of the designer's toolbox, like pencils and rulers did, it has gradually created its own environment, one that involves processing much more information and looking at many more options.

Although creativity is an important role-player in the design process, it is merely one *part* of the process, as a designer must ultimately work within the technical limitations of his tools. The initial design process using CAD would be the same as in any other approach, viz. determining a brief and the specifications of the requirements, and including the parameters of the project. However, the computer makes the product design process much easier by facilitating such functions as analysing the properties of the materials to be used, and identifying possible shortfalls in behaviour at particular settings. Volumes, surface areas, material weight and other information are easily gleaned from drawings or computer models. Moreover, once the idea for the product has been translated into a 3-dimensional model, it is in digital format, and can be easily communicated to manufacturers and clients. One of the key features of the system is its flexibility, which allows the designer to alter the product an infinite number of times, without needing to produce a prototype each time in order to assess the design. Hence, the physical effects of serial production can be seen in the products that have an increasing freedom of form, which in turn is also facilitated by the ever smarter and smaller technologies that allow some products (electronic devices, for example) to function.

3.1.1 Unlimited aesthetic options

With so many tools available, the designer has access to seemingly unlimited options in terms of the aesthetics of a product. Zeitoun (De Noblet, 1993: 376) describes an especially notable tool in the CAD system as:

> "... the one which enables designers to define a surface by means of a number of points in space which are automatically created by mathematical calculation. These points – points of control or positioning – serve as a guide for the creation of the desired surface. By moving them, the designer moves the surface interactively. The position of the points is determined by a series of algorithms, that is to say mathematical rules, which not only function in this way as tools, but also as potential stylistic forms with *distinctive visual characteristics*." *(my own emphasis)*

These seemingly endless possibilities have indeed resulted in a generation of products that are created from complex surfaces and unusual surface finishes. Some people think that these forms are unique to the software being widely used by designers. Lisa Gralnick (2001: 8) believes that there is an emerging and identifiable class of object that owes its life to the development of digital technologies – forms determined by the ability of certain CAD programs to create fast variations on existing products. In *Design Culture Now* (Albrecht et al, 2000: 27), it is suggested that the advent of technologies has created a "fluid" environment in which structure and surface merge effortlessly, because of the new technology. Advanced computer-aided systems for design and manufacture have facilitated complex 3-dimensional forms used in the context of buildings, objects and interiors. Many designers are exploring more curvilinear forms in contrast to what was previously possible. It is no longer necessary to turn the product into a 2-dimensional representation or drawing during the design process, as the entire process deals with the object in its 3-dimensional form. These products, then, embody the way in which serial production processes have directly influenced the form of artefacts.

With so many opportunities and variations possible in the field, one has to consider how designers will indeed steer their design process, beyond mere fulfilment of their brief. Tim Benton, in Greenhalgh's *Modernism in Design* (1990: 45), proposes that there would be some form of evolution, as the processes of mass production and competitive marketing would tend to purify and improve the forms of industrial artefacts, in the same way that natural selection works to perfect organic forms. He continues to suggest that these new forms are the characteristic products of a civilisation that has been radically changed in every way by industrialisation.

Betsky, writing in *Blueprint* (1999: 26-27), touches upon industrial designers from Wedgwood to the Bauhaus. He suggests that mass production has produced goods of increasing quality, but that there has simultaneously been a change in the form of products, some of which are now more like tools in character. In many ways, items are more material-efficient, functional and ergonomically satisfying. The freedom to create within the new technologies is almost limitless, and the designer's discerning input is

therefore more important. The skills needed to operate the new systems should "in no way be viewed as more important than the design vision, that will recognise the desirable object amid the field of endless possibilities" (Betsky, 1999: 27).

Most new products incorporate some element of information. In other words, many products, be it a household appliance, tool or some kind of electronic device, contain a microchip or some computer data to facilitate its functioning, and this will inevitably become more commonplace. Gros, in *Industry or Art?* (1988: 169), suggests that a revolution is occurring in the design of any product incorporating microelectronics. He recognises that the world of microelectronics, continually shrinking as technology advances, means that designers cannot apply the old rules of honest design. It is no longer necessary for the form to reflect the function. The external form "is no longer treated as a transparent covering but as a screen onto which metaphorical interpretations of invisible technology can be projected" (Gros, 1988: 169). The designer thus needs to employ product semantics to create or suggest function in the form that houses ever smaller and faceless technology.

3.1.2 Mass customisation

Working from Le Corbusier's statement that "a chair is in no way a work of art; a chair has no soul; it is a machine for sitting in", Betsky (1999: 26) concludes that many design writers since then have believed idealistically that machine production "could bring out true beauty, which would be the nature of material, use and construction revealed." Developments in the area of science or technology would be personified by a new kind of object, whose use was self-evident. Betsky suggests that a sense of self may be reintroduced to objects, as serial batch production and mass customisation become a reality.

Guidot writes (de Noblet, 1993: 399) that Gaetano Pesce has been allowed to experiment in the laboratories of Cassina (an Italian design company), introducing chance elements into the production process, creating "an element of differentiation among mass produced objects". This type of work seems to be growing in importance as consumers increasingly criticise the repetitiveness of mass produced items.

Customers like to feel that they are empowered by choice, and that what they have bought is unique in some way. The idea that they may be able to choose from an infinitesimal range of forms is like a dream. The reality is, however, that marketing and distribution will need to develop very swiftly to keep up with the idea of "serial batch production".

3.1.3 Limitations of the technologies

A designer has certain tools at his disposal, and he needs to solve the design problems presented to him within a certain framework. The design process is increasingly becoming a means of exploring the potential of hardware and software available to the designer. He can also expand the parameters to solve questions of form, which leaves him to consider the shifting role of creative thinking and imagination in an environment predominantly influenced by production technologies.

Mark Gagiano of Freeplay Energy Plc (2002) feels that the software can either enhance or limit the design. In some cases, the software will provide options or solutions that one may not have thought possible, whereas in other cases, the software is not able to achieve what one desires for the product. Gagiano states that his creativity is limited in that, when designing a plastic component, he needs to comply with the basic principles of design for plastic production. Ribs, bosses, draft angles and wall thickness are all features of thermoplastic products. The role these features play lies in reducing material cost and reducing cooling time in the mould – which all contribute to the viability of a product. After all, the product will not progress to the development phase, unless its manufacturing is deemed to be viable or cost effective.

When using CAD/CAM techniques, where the 3D model drives the process, a common limitation is that of the software's ability to model complex surfaces. A designer who utilises many technologies, like CNC machining, stereolithography, vacuum casting and laser cutting in the prototyping phase, and injection moulding, co-moulding, insert moulding, die cutting and punching metal components in the production phase, soon learns where these limitations lie. Gagiano (2002) suggests, however, that "it's not about limitations – it's all about learning to adapt to these new technologies and trying

to push the envelope a bit. This usually allows one to design and develop unique products."

Paolo Pedrizetti of Paolo Pedrizzetti & Associati (2001) felt strongly that the designer's role was entrenched at the beginning of the process – where all the thinking and conceptual work took place, at the drawing board with pencil and paper; the computer only thereafter became involved in the process, viz. at the prototyping stage. Dealing predominantly with the technologies of casting and injection moulding, the CAD system would seem ideal for the implementation of the designs. Pedrizetti thus suggested that it might benefit the creative process to *not* know which technologies would be involved in the production of the object. Nonetheless, he also added, "if you don't know the technologies how can you design something? You can design something, but if it cannot be produced, then what is the point?" (Pedrizetti, 2001). This attitude is typical of the dilemma faced by designers. Ultimately, Pedrizetti felt thought that it was better to focus on the studio work, making drawings etc, and only to consider the technologies that must be used for production when the time came to making final decisions about the shape or form.

Pedrizetti's concept of looking for and finding the appropriate technology *after* solving the initial problem is similar to the approach of Roelf Mulder of ...XYZ Design (Pty) Ltd (2002). Mulder said that they designed what was best suited for the product – the design was not driven by the process, and he did not feel that production technologies limited the creativity of his work. Being familiar with and involved in various technologies, such as plastics injection moulding, vacuum forming, blow moulding, metal castings and alloy casting, ...XYZ Design have a broad range of experience that allows them to make informed choices. Moreover, it enables them to be innovative. They also seek to get the technologies to work for them, be it cheaper or more effectively.

Guido Venturini (2001), in contrast, felt less attached to the initial hand drawing process than Pedrizzetti, conceding that he did sometimes just start at the computer. Ultimately, he spent much time working at the computer, learning and utilising different kinds of

technologies, depending on the project. When working with plastics, for instance, injection moulding using steel moulds is the obvious route, but there is a different technology involved each time. At the time of the interview, he was busy on a project being produced in 3D, so the use of computer design, and then prototyping, with the CNC machine and CAD/CAM processes was a natural progression. He agreed that the prototyping was very useful, allowing a couple of adjustments to be made before the mould-making phase. He did, however, assert that he challenged the technology all the time, to "see if it will do something new". He felt that he often had technological problems, because whenever he thought of something, it was a little bit more advanced and more complex than the technology, and that in some ways this indicated the freedom of creating things by hand. He proposed, nonetheless, that the technology does sometimes also offer new possibilities for expression, which gives rise to a different kind of creativity.

Gregorio Spini of Kundalini Design s.r.l. (2001) also did considerable research into new technologies and kept a keen eye on the technological developments in the furniture and fashion industries, because the fashion industry appeared to have access to considerably more funding than the product design industry. He said that they often proposed projects, to try to apply these new technologies and to move into a variety of fields. He said that, "obviously we are very different to fashion but still there is a relationship wherever the technology is really fresh."

Spini did not feel that production technologies limited the creativity of his work, but rather that they tried to push the limits of such technologies. Sometimes, for instance, a designer would suggest something new in a factory producing an object for Kundalini, and as a result the technology, or how it is applied, would evolve. There is a sense of pride when one has pushed the limits, and created something that has never been done before. He thus maintains that experimentation is important, and that, even if the new application of the technology is unsuccessful, there are plenty of other methods to choose from. Spini referred to the halogen bulb as an example of a product that originated as part of military research, but has since found mainstream application. For

this reason, he asserts that designers must keep up to date with developments in technology in a variety of fields.

Liberta (Figure 3.1), a groundbreaking chair for Meritalia s.p.a., is created purely from aluminium sheet. It is an excellent example of the application of laser cutting technology, as the chair is cut, and then folded and assembled. Columbo Silvio of Meritalia s.p.a. (2001) confirmed that the company uses the technologies of laser cutting and injection moulding, among others, in manufacturing their furniture. The technology is influential, in that there are often changes to the design as it reaches the final prototype stage, when there are many production considerations. He suggested that this process often limits creativity because of the cost, although one could argue that one is merely guided rather than limited by the cost of the technologies.

Figure 3.1. *Liberta.* Meritalia: c.2001

Like Silvio, Adriaan Swanepoel of This Way Up Product Design c.c. (2002) also felt that the production technologies placed a major limitation on the creativity of designers' work. Cost was a concern, especially if the client was trying to be particularly thrifty, and one had to challenge the limits of the technology to an acceptable standard (in other words, to meet the client's requirements). As far as CAD/CAM systems were concerned, Swanepoel did not think that it was limiting in how it was used; a far more significant limitation in the local South African context was that of finding a reliable place to have this prototyping done.

The major physical effect of serial production technologies has been that they provide a choice of form. The new technologies are able to accommodate more complex, fluid shapes and compound curves, which would have been challenging from an earlier production perspective. The main effect is freedom of the form on one hand, and

constraint or limitations on the other. After all, viability is always a consideration in the mass production context, and plays a role in determining the physical forms of the objects (including features like ribs, bosses, etc). While there will always be a limitation on mass production items, by virtue of the scale and dimensions of machines, these must not be viewed as limitations that cannot be challenged. As technologies continue to evolve, their limitations recede and the designer can explore the freedom of form available to him.

3.2 General View of Jewellery

Many of the serial production techniques had been developed for one particular application, and then slowly evolved to be used for more diverse applications in different materials and products. This is also true of many of the techniques that are applicable in the jewellery industry today. As the field of production and prototyping in product design increasingly heads towards miniaturisation, particularly in the field of electronics and other smaller scale applications, so these technologies become more relevant to the intricacies of the serial production of jewellery items. Although the development of new technologies (such as computer-aided design) has become a significant factor affecting product design, the jewellery industry has been slow to adopt these technologies. However, new techniques, including much of CAD/CAM software, are increasingly focusing on a jewellery application.

In *Jewelry - Contemporary Design and Technique* (1983: xvii), Evans discusses the new techniques, cheaper basic materials and the means to mass produce that grew out of early mechanisation. These new processes that had been developed for serial production had indeed made an impact on the forms and finishes of the pieces. Precision casting, steel die stamping and mechanised buffing were among the first pertinent technologies in this regard. As in the field of product design, there has indeed been a new freedom of form that stems from such technologies, as well as the use of newer materials and alloys. Moreover, these technologies are becoming increasingly important as South Africa expands its jewellery export market.

3.2.1 Technological pioneers

Stanley Lechtzin is appropriately considered by Watkins (1993) to be a pioneer in the field of technologies. Lechtzin's most significant venture in 1992 was his exploration of non-physical jewellery models. He created many drawings using a CAD system, arguing that new areas of aesthetic development were bound to be discovered by using the new technology. The fact that Lechtzin's forms were "altered radically", is attributed by Drutt (1995: 27) to the fact that they were determined by the technology he was using at the time. Some of his works, like XBrace (Figure 3.2), are just specifications for models, a step away from being real. For some, this leads to the argument of whether there is any value[4] in "virtual jewellery or objects", as there is no physical interaction with the object, which many traditionalists[5] would regard as pivotal for their creativity, and the computer is thus seen as a threat to the 'craft tradition'.[6]

Figure 3.2. *XBRACE.tif.* Stanley Lechtzin: 1992

In *Jewelry of our Time* (1995: 15), Drutt refers to David Watkins as a forerunner of technological thinking; Drutt thus argues that, while jewellery design is not necessarily dependant on a craft-making technology, advances in computer design and manufacture may make 'craft' an obsolete notion for art jewellers. Watkins' Torus neckpieces (Figure 3.3) are in stark contrast to Lechtzin's in that he (Watkins) designed them to be worn. Made from brass, these pieces were manufactured by using the technology of laser cutting. The result is a sleek and precision-manufactured piece of jewellery. Although Torus 280

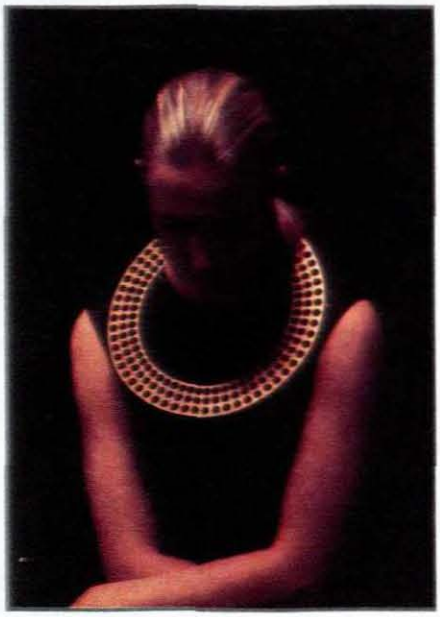

Figure 3.3. *Torus 280 (B3).* David Watkins: 1990

could be easily mass manufactured, because of its design as a piece of art jewellery, it seems unlikely to appeal to the mass market.

Figure 3.4. *Brooch scale prototype in comparison to on-screen 3D model.* Staci Kerman: 2000

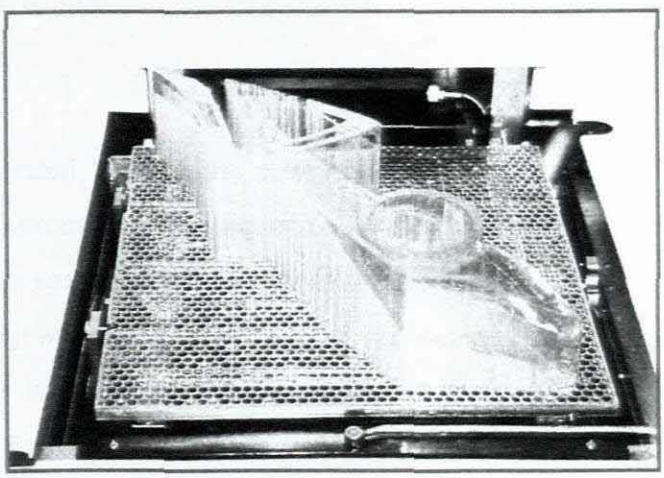

Figure 3.5. *Partial build-up of Brooch model in stereolithography tank.* Staci Kerman: 2000

Staci Kerman's vision was to build bridges between art and technology, as she began to explore the potential of stereolithography in a jewellery manufacturing context (Figure 3.5). Writing in *Metalsmith* (2000: 36), she describes her research into alternative technologies including silicon mould making, ceramic shell casting and the use of actual prototypes as the artefact. She explains her rational choices made in terms of finish (in some cases, the surfaces were left untouched to indicate the process used). She also describes her exploration of the limits and possibilities of forms using the new technology. She made use of duplication, production of mirrored forms and scale manipulation – which is particularly pertinent for application in the jewellery industry. Moreover, these forms were directly possible because of CAD technologies (Figure 3.4).

Robert Baines has chosen to use his filigree work – which are similar to computer wire-frame models – as the experimentation ground for his investigation into powder coating technologies (Figure 3.6). His new works make use of this technology, in which pigment is electrostatically applied to a metal surface. The usual context of this process

is that of coating a domestic product, and the result is a recognisable surface finish.. Undoubtedly finishing is pivotal to the process of jewellery making, and an increasing number of jewellers use mechanised polishing and finishing techniques. Processes such as anodising are also becoming more widely used.

In Pulee's *Twentieth Century Jewelry* (1988: 99), Wendy Ramshaw declares herself part of a machine aesthetic, and not a craft aesthetic. She argues that serial production should not be looked down upon as a debased form of manufacture (the view of some art jewellers), as long as the final artefact is well made, and points out that an excellent finish is often only achieved by using mass production techniques.

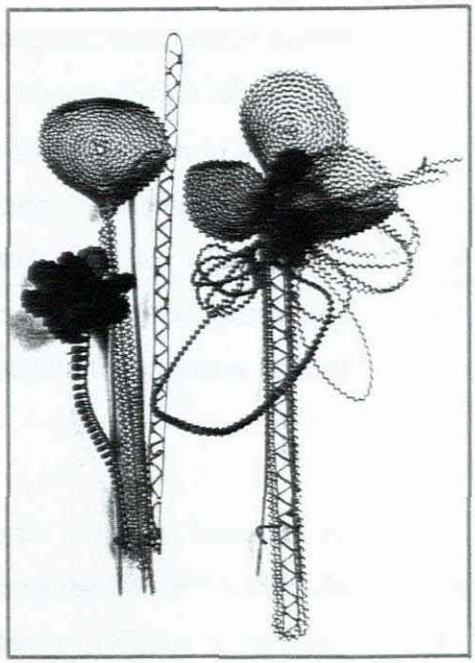

Figure 3.6. *Brooch no. 29.* Robert Baines: 1998.

Although the jewellers discussed above operated beyond the constraints of a mass produced jewellery environment, their explorations and techniques could find a more commercial application at a later stage. A more specific examination of the influence of the processes on the forms of mass produced jewellery in a commercial setting, would be a very detailed discussion on restrictions imposed by the physical limitations of tooling for production. The role of these production technologies in existing jewellery businesses will be discussed in the following section.

3.2.2 Role of technology in industry

In their bid to create a world-class jewellery export industry in South Africa, NEDLAC and FRIDGE sponsored a cluster study for the South African jewellery industry. This study, undertaken by Kaiser Associates, an international strategy consulting firm, was completed in 2001. The study included an internal industry analysis, a worldwide market overview, a detailed market analysis, competitor analysis, world-class benchmarking and final strategic recommendations. It was found that the prominent competitors in this field internationally were Italy, India, Germany and Japan.

Kaiser Associates found that there is a strong international demand for South African products, and consequently most major manufacturers have targeted increases in export volumes. Considering that the Italian jewellery industry as a whole consists of ±10,000 production units of which 70% employ less than 10 people, there is much to learn for South Africa in terms of the production of jewellery for export. Although marketing initiatives, government financing plans and industry re-organisation are all key steps towards expanding the export market, another important factor is the development and implementation of new technologies, which help to accommodate the volumes needed for an expanding export market.

Kaiser Associates accordingly recommends that the South African industry be encouraged to adopt new processes and materials, and promotes the use of CAD/CAM technologies in order to "build a core competency around design" (Kaiser Associates, 2001a: 312). Many industries in the export markets (such as the USA, Italy and the UK) have emphasised the development of production technologies, and have offered the infrastructure to achieve their goals. Production technology is a particular focus in the USA, whose organisation of Manufacturing Jewellers and Suppliers of America offers an annual seminar on New Technologies, including laser technology, CAD/CAM systems, new technologies of mass finishing and technologies from other industries. The Italians, in a similar vein, have developed the "Il Tari" complex in the Naples area, which serves all jewellery members. The Italian complex is focussed on providing services such as CAD/CAM technologies, rapid prototyping equipment, CNC technology and laser technology. The Jewellery Industry Innovation Centre (JIIC) in the UK also provides support services to the jewellery industry. This centre offers expertise in many techniques, such as CAD/CAM systems, CNC machining, rapid prototyping, laser welding, CAD/CAM 3D scanning, and electroforming.

Kaiser Associates also recommended that the curricula of the tertiary educational institutions in South Africa that offer Jewellery Design and Manufacture programmes should be modified, in order to shift the focus to the application of more recent technologies, thereby equipping their graduates to deal with such new technologies in the industry. With this in mind, the jewellery department at the Technikon

Witwatersrand has decided to focus on technology. Consequently, an industrial designer, Andro Nizetich, was appointed in 2002 to facilitate the introduction of computer technologies usually used in the industrial design context. For Nizetich, the key is "using technology to duplicate traditional skills in jewellery making to produce jewellery more accurately, more efficiently and faster – all of which is linked to mass production, and ultimately export" (Anon, 2003b).

3.2.3 Limitations of the technologies

There are considerable benefits to making use of the new technologies in the mass produced jewellery context, not least of which is offered by the CAD/CAM systems. These not only afford better accuracy of the models, eliminating any problems with variable thickness or material wastage, but they also cut out the time-consuming handmade wax model making process, and the fact that such a model can only be used once. Perhaps most useful is the fact that the CAD file is reusable, and can be altered in terms of scale or surface finish, so that many variations can be generated.

Martin Ammann of Oroafrica (2002) sees that the future of the jewellery industry is inextricably intertwined with the computer-based technologies. His company produces jewellery on a mass- and limited production scale, with a few unique pieces as well. They are considered the largest jewellery producer and exporter in Africa (Oroafrica, 2003). They have fully automatic casting machines that control temperature and inject the gold. Ammann feels that at this point he is not designing for technology, although it does play an influential role, as he cannot design something that is not suitable for manufacture. He holds a very different view for the future though, and thus a fully equipped laboratory for CAD/CAM systems is currently being set up on the premises. There will be a rapid prototyping machines to make wax models, as well as numerically controlled milling machines. He maintains that creativity is the key to finding solutions, and thus he feels that their work will become more interesting as the new technologies become the standard means of manufacture. In 1998, Oroafrica entered into a joint venture with Filk s.p.a.[7] of Vicenza, Italy. As a result, a high-tech gold chain factory was established on the premises of Oroafrica in Cape Town. As Filk s.p.a. is the

world's largest producer of gold chain, this relationship ensures that Oroafrica keeps abreast of chain-making technology and techniques.

Luigi Bon of New Silver Export (2001) also does not feel limited by the technology. He prioritises design first, and only then makes the decisions as to how the items will be manufactured. This can, however, mean alterations to the design in the process. In the area of Vicenza[8], site of the annual world Jewellery Fair, approximately 70% of design is now executed on computer, and then models are made using the rapid prototyping technology. Cost is seen as a major limitation on the technology. Bon gives the design for his piece to the modelmaker on paper, and it is then translated into a CAD drawing. Bon admits to confidentiality concerns, especially if he is requesting models for high profile clients. While New Silver has designer clients like Pianegonda[9] (whose designs are copyrighted), they also maintain a digital catalogue of their own products. It is updated continually, as items are photographed by digital camera and then fed immediately into the system. Clients can be sent a selection from the catalogue in CD format. The selection of jewellery pieces that are ultimately included on the CD allows for differentiation between the US and Italian market requirements.

Figure 3.7. *Documenting process for the design catalogue.* New Silver: 2001

Randazzo Corrado of Li Ori (2001), based in the manufacturing area of Valenza[10], believes that technology need not be a limitation, but rather that a combination of technologies can solve most problems. Using a combination of elementary technology and new technology creates an area of overlap into which most of their products fall. Corrado has been using computer-generated models since 1999, and, like Bon, also harbours concerns about confidentiality, as he has designer clients such as Bulgari[11] and Pomellato[12]. For him, the major advantage of the system is the time and money saved in terms of model making.

Stuart Benade, senior jewellery designer of Galaxy (2002), agrees that the whole point of mass production technologies is to save production time. This is important when one is producing large volumes of jewellery: the quicker a piece can get through the factory without being sent back the better, as it affects the price. He does, however, feel limited in that the process sometimes involves a compromise: "at a personal level I'd say sometimes I feel like I'm selling myself short". Although Galaxy is not involved with CAD/CAM technologies at this stage, the other technologies, such as casting and laser welding, do place constraints on the design. In order to compromise in the design process, the piece is first conceptualised in its most dramatic form, and then the technical issues are resolved. Benade believes, however, that one can learn to play within the parameters of the technology, and that there is much flexibility within those parameters.

In conclusion, then, this chapter has examined the physical effects of serial production in the areas of jewellery and product design, as well as the opinions of designers in the respective industries. Technological advancement has influenced the freedom of form in mass production techniques. There has also been considerable progress in manufacturing time, as rapid prototyping is an excellent timesaving technology. Physically, there is no marked change in the forms in the jewellery in the mass produced context, but greater volumes are much easier to manufacture. A great advantage, as mentioned by Staci Kerman, is that the forms of the artefacts can be manipulated from a single drawing, into an almost limitless variety of scale and component adjustments. This is only possible because of the available technologies, and therefore these variations on a theme are examples of how serial production has influenced the forms of artefacts. Better surface finishes are also possible with newer technologies, such as etching and laser cutting (which results in pristine, accurate edge cutting). Although the numerous mass production processes do have various limitations, they are nonetheless very significant, as has been argued in this chapter.

[1] See definition of terms.

[2] See definition of terms.

[3] See definition of terms.

[4] There may appear to be little financial or commercial value in "virtual jewellery", as it would be difficult to sell a "virtual product". The theory of the exploration of a new medium of jewellery would, however, be valuable in the art jewellery context.

[5] The term 'traditionalist' refers to individuals who hold fast to the principles of traditional jewellery-making techniques, and especially to traditional materials.

[6] See definition of terms.

[7] Filk s.p.a. was founded 30 years ago, and has become a world leader in chain manufacture, producing 10 million pieces of chain annually (Weil, 2004: 5). They are leaders in the development of chain-producing technology, with an in-house department for machinery design and manufacture.

[8] Vicenza is seen as an important jewellery production area in Italy. It is also the home to the international jewellery trade show, Vicenzaoro. The show attracts close to 1500 exhibitors. Orogemma (for retail distributors) and Oromacchine (gold jewellery manufacturing systems sector) run concurrently with Vicenzaoro. These fairs are seen as pivotal events in the jewellery industry calendar, for international exposure and trading purposes.

[9] Pianegonda is an Italian jewellery company that specialises in the use of sterling silver and coloured gemstones. Catering for the upper end of the market, they have reported impressive sales figures in the USA, and now have an office in New York.

[10] The province of Alessandria is home to the industrial district of Valenza Po, and is unique in that 40% of the working population are employed in the gold and jewellery sector. 30 tonnes of gold are used in the district each year, and 80% of all the precious stones imported into Italy are used in jewellery in this area. An estimated 1,550 million Euros is the overall turnover of the jewellery-related companies in the district. Exports are estimated at 50% of the total production. Despite being such an important area (approximately 900 companies are dedicated to jewellery manufacture), the companies tend to be small and family-run, with an average of 5-6 employees each. (Italian Institute for Foreign Trade, 2004)

[11] Bulgari is a well known jewellery company, which opened its first store in Rome in 1905. Bulgari have developed a distinctive style, while designing and manufacturing jewellery for the upper end of the market. Bulgari has become a brand that extends from jewellery to accessories, eyewear, perfume and other items. (Bulgari, 2005)

[12] Pomellato, an Italian jewellery company, was founded in 1968. They are based in Milan, and cater for the upper end of the jewellery market; many of their pieces are handmade.

4. IS QUALITY COMMUNICATED THROUGH SERIAL PRODUCTION?

Ever since mass production was combined with mass marketing, there has been a relentless quest to lure the consumer to purchase mass produced artefacts. The 1950s saw an unprecedented increase in manufacturing industries, and manufacturers with an endless line of products had to generate demand among consumers. By adopting an approach of 'built-in obsolescence' in products, the 'throwaway culture' was born. The mass media assumed a hugely important role, not only in promoting consumerism, but also in projecting values of society. Riazman (2003: 295) writes that, "manufacturing and new strategies for design, marketing and advertising combined to create forms and associations that appealed to a diverse audience linked by a belief that consumption and materialism were the means to individual fulfilment". This attitude of consumerism and materialism is prevalent today.

There are so many variable factors that play a role in consumer choice, but as the scale and speed of production of the consumer society accelerates, it becomes increasingly important to maintain industries by designing the product in such a way that the consumer will *desire* it.[1] It is imperative to investigate the metaphoric communication of ideas in the design, as well as the images of quality or *perceived value through technology*[2] in the context of manufacture.

The degree of excellence of an object can be described as good quality, and is just one factor that influences the consumer's product choice. Desirability is another attribute that would suggest to the consumer that the object would be worth having. These two characteristics, viz. quality and desirability, rely upon each other for their success, and both form part of the greater complex picture of the many factors that influence how consumers choose their products. These traits are, however, difficult to define or isolate, as the impression of quality or desirability is created by a combination of a host of other characteristics. Other (more definable) factors that play a role in the consumer's decision making process will be identified and considered in the discussion below, in

order to establish their relationship (if any) to serial production processes. This study, then, is an attempt to determine whether any aspect of serial production technology plays a role in perceptions of quality, thereby influencing product choice. An overview at the end of the chapter will enable conclusions to be drawn in this regard.

The factors influencing product choice that are discussed in this chapter are a combination of known factors as well as factors discussed in the interviews.[3] Assigned value, the first factor influencing product choice that is discussed in this chapter, indicates that by our choice of product, we assign a specific value to it; a perceived individual expression thus plays a role in product choice. The idea of instinctive choice, the second factor, is also discussed below. Aesthetic preferences, social/cultural filters, visual symbolism and product semantics all form part of the process of instinctive choice of product. Functionality is the third main factor that plays a role in product choice, and it is more obviously linked to the processes of serial production. The fourth factor, tactility, which is obviously a concern in every 3-dimensional object, is also closely linked to mass manufacture, as the consideration of serial production processes in the choice of material and finish is clearly important in product design.

The ideas of environment, being the fifth factor, also play a role, as a consumer chooses an object based on his or her social orientation and emotional response to the assumptions or ideas behind the product. Assumptions relating to function and production form part of this environment. A sixth influential factor is the spiritual importance of the object. The essential principles of design at Alessi, for instance, indicate the importance of the spiritual aspect of any product, relating to the 'object psychology' outlined by psychoanalyst Franco Fornari. Branding, the sixth factor influencing how consumers choose products, is clearly a significant contributing factor. In this regard, the repetitive mass production processes facilitate the link to the quality assurance we expect by identifying a logo on a product. Finally, production methods are not often consciously considered in choosing particular products, but they are nonetheless frequently used in a jewellery context. Although consumers seem to be generally ignorant about the processes themselves, the allure and perceived individuality of the handmade artefact is obvious.

Factors influencing product choice

4.1 Assigned Value

Batchelor, in *Henry Ford: Mass Production, Modernism and Design* (1994: 140), suggests that we give the mass produced item its value through the process of our personal choice / by making a personal choice. In this way, we create our own authentic personal product, allowing the events of our lives to alter our feelings towards the object. It is through these emotions, which constitute a kind of perceived individual expression, that we have the potential to make each mass produced product unique. This, however, is not a tangible and reproducible quality that the marketing gurus can exploit, beyond suggesting how a product may fit into a person's lifestyle. They have no access to the nostalgia, sentimental value or personal attachments that are formed in the mind of the consumer. Marketing campaigns can, though, suggest nostalgia or allude to a period that evokes memories, and in this way can attempt to tap into these emotions.

Norman, in *Emotional Design* (2004: 46), suggests that mementoes, souvenirs and keepsakes all have value, despite the general view that they are seldom beautiful, and could be labelled as kitsch. Norman states that the "object is important only as a symbol, as a source of memory, of associations" (2004: 47). In a similar way, one could view curio jewellery as this type of object. In the context of jewellery manufactured in South Africa, then, the idea is that the African imagery and use of materials in curio jewellery serves as a reminder of a trip to Africa.

As choice clearly happens in the mind of the consumer, and as the idea of assigned value would apply equally to jewellery and domestic products, serial production does not play a specific role in this context. The role of mass produced jewellery in rituals may be considered, though, as the wedding ring is a good example of assigned value associated with the event of a wedding. The jewellery consumers interviewed all mentioned individuality (real or imagined) as an essential factor influencing product choice.

4.2 Instinctive Choice

As much as we can assign value to an object by perceived individuality, so the process of choice appears to be instinctive. Macdonald deals with the context of ergonomic and human factors in *Human Factors in Consumer Products* (Stanton, 1998: 175). Factors influencing product choice and acceptability, in a scientific context, and which will be investigated below, are aesthetic preferences, socio-cultural filters, visual symbolism and product semantics.

4.2.1 Aesthetic preferences

Apart from the obvious customary fulfilment of a functional need and ergonomic suitability, a product can provide pleasure through its aesthetic qualities. Rotte (1993, cited by Macdonald 1998: 176) states:

> "To perceive things means becoming aware of things or experiencing things through our senses. If we are then talking about design and aesthetics, we are talking about sensorial experiences with man-made objects, design. A complex process determines the quality and value of that sensorial experience."

Traditionally, the field of human factors and ergonomics has primarily been concerned with preventing injury or discomfort when using the product. In fact, little research has been done in respect of enhancing the user's experience – and a more encompassing approach is needed in this regard – in order to do better than just prevent injury. Through his work into "transgenerational" design (which is defined as design that can be used by a wide range of ages), Pirkl (1988, cited by Macdonald 1998: 176) has designed a model to be used when considering the design of a product; his model combines design concerns and human factors. His premise is that using both sensorial input (e.g. visual focus, tactile sensitivity, colour perception and hearing) and physiological data creates a balanced product. In order to appreciate any object in its environment, all the senses must be engaged. Similarly, the memory of a pleasant experience can be evoked completely by just one sensory experience, like a familiar

sound or a pleasant smell. In theory, therefore, the correct trigger can evoke a complex aesthetic response.

There are many who feel that the experience of the product is tantamount to the comprehensive evaluation of the object. Aesthetics is not an absolute or separate value, writes Zaccai (Buchanan et al., 1995: 9), but rather it is inextricably intertwined with our "ability to see a congruence among our intellectual expectations of an object's functional characteristics, our emotional need to feel that ethical and social values are met, and finally, our physical need for sensory stimulation."

According to Macdonald, "in products, we look for the delight and reassurance through our senses, for feedback which reinforces that we have made the right decision" (Macdonald in Stanton, 1998: 180). The majority of jewellery consumers interviewed mentioned 'design or styling' as important factors when choosing a piece of jewellery. The aesthetic aspect is obviously an important part of the function of adornment. Serial production may play a role here, by facilitating a functionalist approach to the design of the object and thereby influencing the aesthetic of the object, which may in turn be associated with a sense of quality. However, although a technological aesthetic may be created by serial production processes, it is not likely to convey a particular sense of value.

4.2.2 Social/cultural filters

Macdonald asks whether there are aesthetic preferences that are peculiar to an individual, and others that are specific to groups of individuals or to society as a whole. With this in mind, it is clear that culture, along with social factors, plays an important role in assigning particular value or meaning to sensory experience, and therefore to objects. Hofstede (1991, cited by Macdonald in Stanton, 1998: 180) defines culture as the "collective programming of the mind which distinguishes the members of one group or category of people from another." He accordingly developed a model that reinforces the idea that culture is not genetic or inherited, but rather the result of one's social environment – a type of environmental conditioning (see Figure 4.1). From this

perspective, culture is also quite separate from the individual's personality and what could be called "human nature".[4]

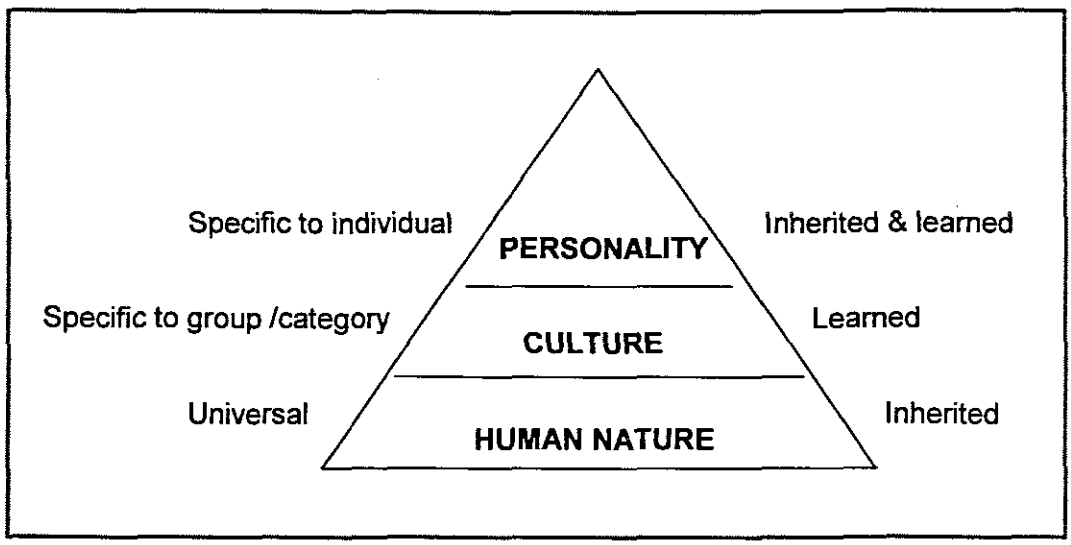

Figure 4.1. *Hofstede's 3 levels of uniqueness in human mental programming*

Social and cultural values assign significance to various sensory perceptions. Sounds, for example, could inform us of the supposed quality of a product through our conditioning – which is the value we place on particular properties of an object. An example would be the sound made by a car door as it is closed; the reason why a heavy "clunk" sound suggests quality relates to our opinions on safety in car design, as well as our frame of reference.

Cultural "filters" play an important role as one discriminates between products. An individual with Western cultural values and a Japanese person who both touch and hold the same personal stereo, would assess the object in different ways. Although they might both associate a thinness of profile with high technology, the associations with weight would differ between the cultures due to historical and cultural factors. The Japanese individual would most likely be looking for a lightweight[5] product, whereas a Western individual may associate weight with quality. One could compare the values associated with weight and another factor, for example, thickness. This becomes feasible if one compares two physical characteristics of the same object against associated qualities within a *specific* group of products. This could then continue,

comparing different characteristics or sensory qualities of the same product or range of products.

A research project referred to by Manzini (de Noblet, 1993: 414) and focused on design culture asks the following questions: "How is it possible to give cultural weight and permanence to products immersed in an environment saturated with images and in a state of continual flux? How can one invest materials, which can be produced in any form, with an identity, with a fixed mental image of genuine cultural weight?" This is what must be considered in the light of ever evolving materials and technologies. Manzini (de Noblet, 1993: 414) realises that choices made with regard to product form must be made to give the object a specific cultural identity, as a means of stabilizing the situation that is in flux.

Serial production plays a very small role in the instance of social or cultural filters, despite the fact that we live in a very technological society. Choice here would be the most important element, as it seems to form part of the higher expectations one has for the function of one's jewellery (refer to Chapter 1, the Disciplines of Jewellery and Industrial design). The cultural identity displayed in the choice of products or jewellery is inherent in consumers and shows a relationship to status or cultural symbols.

People define themselves both collectively and individually. Several consumers interviewed mentioned that exclusivity was an essential feature when choosing jewellery. Exclusivity caters for a select few, and others are excluded for a variety of reasons (usually relating to the price of the items). The exclusion of others is appealing if one is attempting to make a personal statement, to limit the exposure and be more individual. The identity of the individual within society may be indicated by status symbols (of which jewellery could be part) or other cultural symbols.

4.2.3 Visual symbolism

Macdonald (Stanton, 1998: 183) emphasises that visual symbolism is by no means universal. The cultural conditioning of the user plays an essential role, as does the context in which the object is used, in influencing the perception and sensory experience

of the object (this may include function) – which ultimately determines acceptance of the object. Colour, too, plays a role in determining the attitude of the user towards a product, but it is also influenced by the cultural and emotional position of the user. Different structural parts of a product can be highlighted by means of the clever use of colour, but it can also influence the perception of shape, thickness and proportion, among other factors. Colour forms just one part of the complex visual codes relating to the individual's dreams, values and past sensory experiences that affect the product choice of each individual.

Mahnke, writing in *Colour, Environment and Human Response*, suggests that man's relationship with colour still bears the unconscious conditioning of evolution, of the signals that one learns in nature about plants that are edible or poisonous, or signalling seasons (1996: 12). Although human beings may appear to apply colour arbitrarily, their subconscious will still dictate product colour choices. Perhaps the symbolic values associated with certain colours are also a reference to this subconscious knowledge. Mahnke (1996: 18) maintains that colour physically affects one's brain function and autonomic nervous system, as well as hormonal levels by arousing definite emotional reactions to aesthetic objects. Thus people experience a complete physiological and psychological response to colour.

Fashion obviously plays a role in the use of colour in products, but designers need to be discerning in their use of colour to enhance the product and to use contrast to indicate function. The complexity of the consumer's relationship with mass production is illustrated in the example of a car. If most (mass produced) cars are red, then the consumer will want a black one just to be different – signalling his or her individuality. This is one relationship that remains constant and perplexing. Colour can thus be used to differentiate products that would otherwise be identical.

The choice of colour or visual codes in artefacts produced using serial production methods can be associated with quality. This obviously rests upon the complex visual codes and cultural associations with the application of specific colours. Colour plays a role in several aspects of product choice – aesthetic preferences and social and cultural

filters. However, there does not appear to be a *direct* link between quality and serial production.

4.2.4 Product semantics

Product semantics refers to visual clues to the functioning of the object, as well as to historical references, metaphors and cultural symbols. Jordan and Servaes (1995, cited by Macdonald in Stanton, 1998: 189) have investigated the emotional responses evoked by certain products in consumers. They have developed a range of terms that are used to try and compartmentalise these reactions. Some of them are "security/comfort, confidence, pride, excitement, satisfaction, entertainment, freedom, and sentiment/nostalgia".

It appears unlikely that the serial production process would play a role in communicating quality of the product in relation to its semantics. However, the freedom of form, and especially fluid or organic forms, facilitated by the technologies may allow for better product semantics, and thus a perception of better quality. Serial production could then be said to play an *indirect* role in this regard.

4.3 Functionality

The functionality of an object would seem to be a key feature in assessing a product. Functionality in a merely physical way is easy to assess, particularly in the case of a domestic appliance, or similar object. For instance, if a kettle boils water, then it functions adequately. Normally, though, an object would be produced with suitable constraints concerning safety and efficiency, and the marketing of the product would then play a role, in convincing the consumer of the effectiveness, safety and value of the item. In contrast to household appliances, there are obviously artefacts where the function is less obvious: jewellery, for example, may only have a function of adornment. In addition, though, it may also need to communicate an appropriate cultural message for the wearer.

Serial production technologies play an essential role in the perceptions of quality of an object in relation to its functionality. Basically, as technologies evolve, so the quality of mass produced parts should theoretically improve too (although a policy of built-in obsolescence can be a restricting factor). The function of an object is also one of the design company Alessi's four parameters for success. They hold the view that the mass produced object will be of better quality if it is a *functional* product, as opposed to an object made by an artisan. Reliable function is also an indication of quality, often associated with a specific brand of mass produced product. If the product functions, it is assumed by consumers that it has been through an extensive development process, often involving input from a team of designers or engineers. Much time, energy and capital has been invested in the manufacture of the product. The consumers interviewed in this study agreed that products manufactured in a factory context were liable to function better, and that function was a key feature when choosing a product.

4.4 Tactility

Given that the consumers interviewed here mentioned the multisensory interaction they have with particular products, the tactility of the object clearly plays a significant role in exercising product choice. Are there preferred tactile features like material textures, weights and forms that need to be considered? Choices in respect of material may be based more on qualities like thermal insulation or conductivity, than on safety or functional reasons, but sensory stimulation may also be significant (Zaccai in Buchanan et al, 1995: 4). Zaccai also suggests that we as consumers have become corrupt, and that the sensory experiences afforded by the products of today are too superficial. The possibility of a real emotional connection with the object is excluded (this is clearly the responsibility of the designer, not necessarily because of a specific material choice). Zaccai thus laments the fact that the highly sophisticated and industrialised manufacturers are seldom able to "elicit the same spiritual and emotional connection with their users as the objects produced by our craftsmen ancestors" (quoted in Buchanan et al, 1995: 4).

Livia Balocchi of Balocchi Preziosi (2001) asserts that her material dictates the mood of her jewellery, referring to it as a kind of dictatorial materiality. She feels that the precious or semi-precious stone dictates the spirit of the piece, and this is because she "thinks in stone". The important things for her are the colour, vibration, shape and emotion evoked by the stone. She has consequently pioneered a design concept based on the fact that she is a gemmologist, because she feels that the stones have emotional qualities. There is no metal shaft in her ring, and the metal merely serves as a means to set the stones. Her designs are characterised by the large, intensive use of natural stone (Figure 4.2).

Figure 4.2. *The unique cut stone rings of Balocchi Preziosi*. Livia Balocchi: 2001

While tactility has much to do with the choice of material available to the designer, it is more likely to be associated with quality in the context of the craftsperson selecting a special material, than with the finishes of mass production. Quality can be communicated through the tactility of an artefact and through the choice of surface finish or material, for example, such as an inlay of a different material into an object. Tactility is an essential consideration for the jewellery designer, as jewellery is often worn close to or on the skin. This is partly why Livia Balocchi designs her rings in such a way that the wearer is in direct contact with the stone, not the metal. Interestingly, no consumers interviewed herein mentioned tactility, perhaps because it was an assumed or subconscious factor influencing product choice.

4.5 Ideas of Environment

In *Objects of Desire* (1986: 221), Forty argues that designs manifest social concepts and values, and that they should be viewed in this context. His view is that the social

concept is given little credit and is frequently disregarded. The theory is that the ideas of the world and its social relations are changed into the form of objects that can be mass-produced. He believes that the ideas shape the social environment, and are more than mere 'influences'; as the context without the idea does not result in a product. The 1950s were of particular interest to Forty, specifically with regard to their response to mass consumption. He noted how the reality of women being confined to the home led to manufacturers creating ideas of the nobility of labour and of domestic efficiency in order to sell home appliances. Forty goes so far as to state that "the result of this process is that manufactured goods embody innumerable myths about the world, myths which in time come to seem as real as the products in which they are embedded" (1986: 9).

It is clear that the environment facilitates the development of products that are appropriate in the society of the time. "Without the existence of certain ideas about the nature of domestic life and the part that appliances play in it, none of the products discussed ... could have been designed ... [T]he capacity of design to create form occurs only through the conjunction between ideology and material factors: if either is absent, the union cannot take place" (Forty, 1986: 221). The result is that one either chooses or rejects the objects, depending on one's social orientation and emotional response to the ideas or assumptions behind the product.

There is no direct link between ideas of environment and serial production. The context of the technologically driven society, where consumers are surrounded by mass-produced products, may play an indirect role in shaping products, but it does not affect their level of quality.

4.6 Spiritual Importance

To create the desirable object is a challenge expressed by Baum in *Metalsmith* (1996: 43). He wrote that the ultimate challenge was to create a design that could be readily produced technologically. The task was to have mastered and used materials that

were interesting and desirable, cost effective, and appealed to a wide market. It was furthermore important that the design be imbued with a sense of spirit or personality.

The spiritual aspect of a product is also important to Alessi, as revealed in *Alessi: The Design Factory* (1994: 15). Alessi emphasises the need, as a product manufacturer, to preserve the spiritual dimension of a product within the context of mass manufacture. This was evident when the author visited the factory in Crusinallo (Italy, 2001). Alessi defines its own approach to design as "a creative, global, disciplined, artistic matrix"(Alessi factory, 2001), which is partly because they employ no in-house designers, but invite designers from all over the world to contribute ideas. They feel that this enables them to reflect the diversity and different attitudes of society.

The concept of object psychology, which is based on the work of psychoanalyst Franco Fornari, is paramount. Fornari details the critical relationship between objects and the user, much of which is formed in childhood. The Alessi team feels that it is important to provide the consumer with a deeper psychological satisfaction – in other words, the object must be more than just its physical presence. The principle of *Communication and Language* (Alessi factory, 2001) forms one of the four key principles for Alessi's success. It refers to what language will be communicated *through* the object to the user. Perhaps it becomes a status or style symbol: a status symbol speaks of status, wealth or power in society, whereas a style symbol refers more to a cultural symbol. An example of the latter is the Aldo Rossi coffee maker (Figure 4.3), which is starting to become identified with the world of architecture.

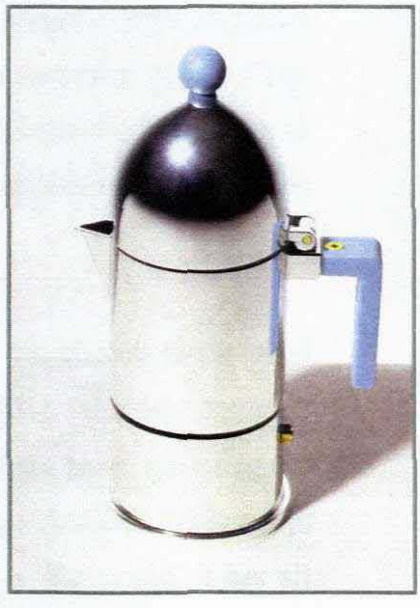

Figure 4.3. *"La cupola" Expresso coffee maker.* Aldo Rossi: 1990

Another principle is that of *SMI (Sense of Reality, Memory and Imagination)* (Alessi factory, 2001) which defines an understanding of beauty by referring to the world of the senses (touch, sight, smell, sound and taste) and to the world of the subconscious

and the imagination. This relates directly to Fornari's "effective codes" theory (Alessi, 2004). His belief is that all objects have many meanings, because of the conflict between the codes inside each person. The four relevant codes are: the maternal code, the childhood code, the code of erotic corporeality and the paternal code. The maternal code deals with satisfying the needs of the child inside us; the childhood code is focused on the importance of play; the code of erotic corporeality deals with the contemplation and exhibition of the body; and the paternal code acts as a stimulus to growth, development and performance (Alessi, 2004).

The writings of English psychoanalyst Donald Winnicott on transitional objects detail the subconscious reaction human beings have to objects. His theory is that everyone has the capacity to play or to be creative. Transitional objects appear as reflections of our imaginations. Transitional objects are first recognized in childhood – as the object to which the child develops an intense attachment – for example, a blanket or a special toy. This object becomes a place of safety in a changing world. Young (2005), similarly, writes that transitional objects are appropriate in all stages of life, as adults can have a less intense, but still comforting relationship with a particular object: "The sensuous, comforting quality and the sense of something that is favourite ... applies to all sorts of things; walkmans have this quality for adolescents, portable computer games for pre-teens, computers for adults" (Young, 2005: 3).

Just as toys are transitional objects for children, so the objects we choose to surround ourselves with serve a similar function. Guido Venturini (2001), who has designed several products for Alessi, agrees. He said, "If you choose with the heart, not using the brain, you choose differently, because you have a certain feeling. You pick the item up, and get a feeling that you don't need to describe in words; it is like music, it has all these different chords. which are happy or sad." Many of the more recently produced products for Alessi have been named to emphasise the playful aspect of their nature. Objects such as "Nutty the cracker" (bowl with squirrel detail, 1993), "Mary biscuit" (boxes for storing biscuits, 1995), "Hot sweet hot" (oven thermometer, 1998), "Mister Meumeu" (parmesan cheese grater and storage container, 1992) illustrate this lighter

touch. These products appeal to one's sense of playfulness or humour. They are not serious or intimidating, but rather create a safe, reassuring environment for the user.

Gregorio Spini of Kundalini (2001) feels that the decision of consumers to purchase one of their lamps was an emotional one, and possibly even spiritual. Kundalini is a Sanskrit word meaning "bioelectrical energy". Once activated, this energy leads to illumination, like inner enlightenment. Spini thus suggests that his designs were visualised in a spiritual environment, which is confirmed by the theories of Forty (ref: 4.5, ideas of environment). Moreover, once a customer relates to these items, he or she gets a sense of the spirit that originally inspired them.

Paolo Pedrizetti (2001) felt that many people, if confronted with two products in the same price range, would choose the item that appealed to their sense of humour, thereby indicating their wish that the product should make them happy. While this may be true in some cases, there are products of a more serious nature that move away from humour and mere cuteness. This approach, of incorporating humour, began in Japan in an attempt to capture the rapidly growing class of young, affluent, working women. Some consumers felt that this approach expressed a sense of condescension towards women, which would steer some away from a humorous approach to design.

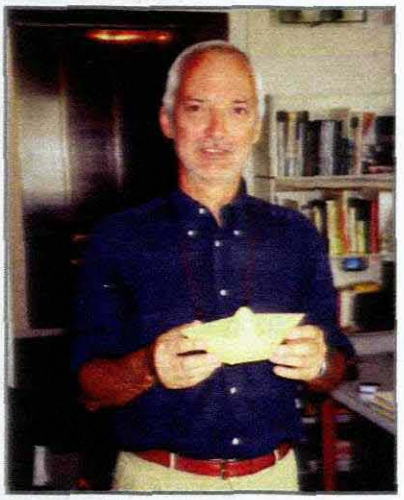

Figure 4.4. *Paolo Pedrizzetti and his playful lemon squeezer.* Milan: 2001

Gauthier writes (1999: 40) that improving the quality of life in the man-made environment is always conducive to the happiness of the consumer. Despite this noble intention, there are, however, many dysfunctional products generated by technological progress. He thus argues that technology seems to have become the focus of interest for design, whereas what is actually needed is a better interconnection between the technological and the social aspects of the product. He advocates a re-examination of the use of the product in the social context.. Venturini (2001) also feels that the art of living is something that is disappearing and leading to a 'poor' or 'impoverished

lifestyle (although not in the financial sense). In such a lifestyle, consumers need beautiful objects to enliven and enhance the home environment. The spaces are neutral and without a particular identity, and so "we need some new and effective thing or form to make it better. If you live in Papua New Guinea, you probably do not need it, you have birds and flowers, palm trees and forests. But in the modern towns, we need the sculpture and beautiful girls in marble, and sculptural items" (Venturini, 2001). The irony is that products that can be bought by the discerning consumer to fill a spiritual void caused precisely because of our industrialized society are an integral part of the manufacturing culture.

The product manufactured using serial production technologies is merely a vehicle to deliver an idea of quality. A well developed design theory or approach consistently applied to appeal to all the senses, then, is more likely to deliver a product that will be perceived as valuable or of good quality. Alessi, Venturini and Kundalini all agree that the spiritual aspect of the product is essential to the design, especially in the context of the mass-produced product. In the design of mass produced jewellery, however, it appears that less consideration has thus far been given to spiritual aspects. Nonetheless, a development of this aspect of design may alter the perceptions of mass produced jewellery, as the quality of mass manufactured parts improve. While it may seem as if the Alessi products discussed above, which operate at the top end of the market, are the only point of comparison to mass produced jewellery, this is not the case. Pedrizzettis' lemon squeezer, for example, is a mass produced plastic product that is not expensive, and is thus a fair point of comparison to mass produced jewellery. The jewellery consumers interviewed made no mention of any spiritual aspect of design as one of the factors influencing product choice. However, as in the case of tactility, this may again be a case of subconscious choice.

4.7 Branding

Branding embodies the desire of a company or product to be distinct. Branding was originally a way of individualising one's belongings: it was applied to livestock, which were literally burnt with a hot iron to make a distinctive and identifiable mark. Certain

shapes and designs became associated with particular individuals or groups, and this was perpetuated in coats of arms, flags and other forms of group identification. The logo – representing an individual or group – falls into this same category by using a stylised form of brand name (Marzano, 1998: 110).

The system of branding has become entrenched in our economic and cultural environments. A brand is a "family of images and values that can encompass a vast series of products. Designers develop distinctive uses of colour, form, materials, letterforms and languages as well as attitudes towards function and content that bring a brand to life." (Albrecht et al., 2000: 159). Much of the information or logos are displayed on or moulded directly into the body of the product, empowering the object by its brand. A powerful brand like BMW has such associations with quality and good design, that the mere logo suggests an intrinsic quality. Is the design *that* good, the quality of the product *that* much better, or are consumers merely victims of a highly sophisticated marketing campaign?

Research by Kaiser Associates into the jewellery market suggests that the Italians are becoming increasingly brand conscious, and that this is not restricted to the top end of the market. They are reluctant to pay for anonymous products or for products of an unknown brand, and have even launched their own "Made in Italy" campaign for their export jewellery. This campaign rides on the back of the international perception of Italy as a source of good design, and has been very successful. The Italians themselves are also convinced of their own superiority when it comes to design. Livia Balocchi (2001) states happily that some of the first jewellery in the world is Italian, and that it is thus synonymous with quality. There is a distinctive tradition of Italian jewellery, and of course the Italian designer, Cartier, makes his chains in Italy, as the country has all the technology and tools available to produce the most beautiful quality items.

Venturini (2001) agrees that Italy is a special place for art and design. He feels that one "just walks on the streets and you breathe it in, you see something special even if you don't want to, you spend so much time in front of or beside such special things, designed by Giotto, or Michelangelo." He feels that Italy is unlike the rest of the world,

and that this is visible at every level of design, from Italian culture, fashion design or car design, to Cartier or Bulgari for jewellery. Venturini remarked that Italian designers do not need many books, as they can merely walk around their cities and they are surrounded by culture and inspiration .

Kaiser Associates recognised that brands are a significant future trend, and suggested that the South African jewellery industry devise their own cohesive brand and market it aggressively, to make inroads into some of the saturated export markets. This could be linked to the existing "Proudly South African" branding initiative. Moreover, the priority would be to develop a brand that has a distinctive African flavour. The jewellery consumers interviewed indicated that a South African jewellery brand would need to steer away from the existing style of "curio jewellery" if it was to be sold locally too. Martin Ammann, for instance, was already preparing to launch Oroafrica's new branded jewellery in 2002. His collection is to be marketed mainly in the United States, with the added bonus that it could be sold to tourists in South Africa as well. His view is that jewellery has been slow to get into branding, but that Africa is nonetheless a very good theme for branded jewellery.

Consequently, Oroafrica launched the Kwela brand of jewellery in early 2003. It is based on the distinctive African designs that are aimed at a tourist market – almost an upmarket curio. Carter (Kwela's brand manager) noted that brand consciousness was "very high in priority and very evident in the international tourist market" (Anon, 2003c). Oroafrica subsequently launched a high-fashion brand, AU79 Pure Chemistry. This is aimed at a younger, more adventurous, target market. It also accommodates a sense of individuality as it comprises a number of interchangeable symbols and letters.

There are many reasons why people purchase products based on their brand name. Balocchi suggests, for instance, that as many as 80% of all consumers purchase by brand. In the jewellery trade, it is often men who make a "safe" purchase for their partners: it is accepted that the brand will be of good quality and expensive, and therefore an acceptable gift. In addition, there is the lure of a status symbol, and (hopefully) the reassurance of quality. Many domestic products have highly

recognisable names, each with its own perception of quality. Goodall (2003), one of the consumers interviewed in this study, said that she would always purchase a brand name in appliances to ensure both quality and after sales service and because they need to function efficiently. Clearly, branding is a very significant factor in communicating ideas of quality. Its link to serial production is that the repetitiveness of the process facilitates a constant assurance of quality (as built up by the identification of the brand). There is thus perceived value because of the brand.

Figure 4.5. *"Girotondo" design pendants.* Alessi: 1998

Companies such as Alessi and Swatch have diversified their products to develop ranges of jewellery that will be associated with quality, because they are an extension of a well-known brand. These items of jewellery are a mixture of materials; for instance, the Swatch Bijoux range uses silver and high-tech materials, including steel and nylon. The Alessi Girotondo range, in contrast, is manufactured only in silver. Four of the jewellery consumers interviewed, although not inspired by the idea of a South African jewellery brand, said that they would consider buying other branded jewellery. These would tie in to the idea of status symbols linked to branding, but also to the higher expectations that exist concerning the function of jewellery, as being beyond mere adornment.

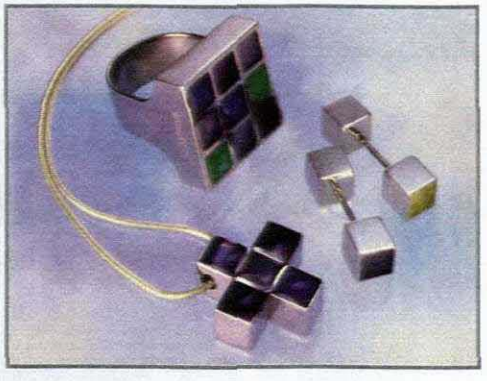

Figure 4.6. *Swatch Bijoux Prismatic collection.* Swatch: c.2001

4.8 Serial Production Methods

The jewellery consumers interviewed had a very limited knowledge of serial production technologies, in either the field of jewellery or in product design. They agreed that the

mass production technologies were an important part of the quality of domestic products (as mentioned previously, some quality associated with mass produced products relates to the well developed branding of the product). They all listed manufacture as the least important consideration when purchasing jewellery; after design, cost and material. Only one respondent reflected that the "method (of manufacture) was irrelevant if the appropriate stamps were in place" (Goodall, 2003). She suggested that she was unlikely to know the difference between a handcrafted and mass produced piece of jewellery of the same design. Clement (2003), however, reflected that "I would hate to know that jewellery was made in a mould – jewellery is not meant to be a thing like that – it is meant to be more romantic".

While cost was generally listed as being second to design in factors influencing choice, the aspect of serial production was not mentioned. Serial production technologies could play an essential role here, though, by reducing the cost of the item of jewellery. This was obviously a factor that was most important for the less affluent consumers.

There is a definite quality associated with the idea of a handcrafted artefact. Thiessan (2003) even suggested that she preferred the idea of "character, even if it is a mistake, included in a handcrafted item". Much of the quality associated with handcrafted artefacts stems from the idea of perceived individuality (mentioned earlier in the chapter in 4.1, Assigned Value). As indicated with regard to status symbols, several of the respondents mentioned "exclusivity" as an attractive attribute.

While most of the respondents conceded that factory-produced items would be more accurate dimensionally and precise in use of material, they all wanted to retain the 'mystery or romanticism' associated with the making of jewellery. This is again linked to the concept of assigned value. The respondents were not interested in gaining information about the field of serial production technologies, and soundly rejected the idea of a brand developed around particular production techniques. This indicates that the expectations that people have of the function of jewellery are always more complex and more demanding than those of domestic products, where the function can be easily assessed.

In conclusion, then, upon reviewing the diverse factors influencing product choice, the degree to which serial production plays a role in contributing to the perceived quality of the object varies widely. In considering assigned value, aesthetic preferences and visual symbolism, serial production does not appear to play a prominent role. When reviewing social/cultural filters, though, serial production may be more relevant, as status symbols may become increasingly technology-based. With regard to product semantics, serial production only has an indirect influence, as it plays an essential part in the increased freedom of form of products. The role of serial production in affecting perceived quality is also indirect, as one looks at the tactility of an object. Mass production technologies could, for instance, play a large role in the choice of surface finish or material of the object.

The ideas of environment have only an indirect relationship with serial production. This is purely because the context is our technologically driven society of the twentieth century, and because the consumer is surrounded by mass-produced products, which might play a role in shaping products. However, the idea of quality is only transmitted indirectly. The spiritual importance of a product is also indirectly related to serial production, as the mass-produced product is merely a vehicle for delivering the idea of quality to the consumer. The processes of serial production, too, have an indirect relationship to quality. As these processes reduce cost, the product is more readily available to more consumers, thus making it less exclusive. This may add value to the item in terms of them being cost effective. Branding, a very important factor influencing choice, also has an indirect relationship to serial production. The repetitive nature of mass production is a key part of quality assurance, which is then related to a specific brand.

The only factor influencing product choice where serial production processes appear to play a direct role in the quality of the object is its functionality. Serial production processes play a vital role in increasingly efficient products. Thus, it must be concluded that serial production generally plays an *indirect* role in communicating images of quality about mass produced products.

[1] While it is possible that badly designed products can be successful purely by virtue of effective marketing, this thesis is concerned with the role of design. Branding, as a marketing tool, is discussed later in the chapter.

[2] Products are assumed or perceived to be valuable or desirable through association with particular manufacturing technologies.

[3] These factors were discussed in relation to the question, "What is it that makes the item desirable, and that makes the person choose this one (it) and not another?"

[4] The concept of human nature as discussed in this context is concerned with the collective characteristics of mankind, as opposed to individual expression.

[5] Historically, the Japanese have lived in a situation of space constraints, due to their population density. Much of their focus of product design has been on lightweight, portable or foldaway objects.

5. CONCLUSIONS AND RECOMMENDATIONS

The original research problem concerned the manner in which serial production has influenced the design of artefacts, jewellery and/or domestic products since 1990 with a focus on Italy and South Africa. Italy is seen as a world leader in jewellery manufacturing technologies and design, and is thus an excellent model for comparison with the South African jewellery industry, which is aspiring to greater beneficiation of natural resources and an expanding export market.

By means of literature searches, interviews and analyses, the effects of serial production on artefacts have been evaluated in different ways. The effect of the concept of serial production was outlined in Chapter 2, from the development of twentieth century functionalism to a technological aesthetic seen in certain art jewellery. The physical effects of serial production were examined in Chapter 3, including the significant role played by CAD/CAM technologies in relation to the forms of domestic products, as well as the role of technology in the jewellery industry. Chapter 4 examined the ongoing perplexing conflict of perceptions of value between handcrafted items on the one hand and those manufactured in the serial production context on the other.

In this chapter, recommendations are made to improve perceptions of the quality of mass produced jewellery in the South African jewellery industry, and thereby to contribute towards the expansion of the industry. Further recommendations are made towards restructuring the education of jewellery design students in tertiary institutions, as well as in identifying areas for further study.

5.1 Abstract and Physical Effects of Serial Production

The advent of serial production technologies has transformed our society in many ways. The concept of serial production has influenced the form of artefacts, in developing twentieth century functionalism and a so-called 'machine aesthetic'. This logical and ordered approach to design is still evident today in many artefacts. A "technological

aesthetic" has been developed by designers in response to their environment. This technological aesthetic, visible in the examples discussed in Chapter 2, illustrates how serial production has influenced the forms of artefacts in a metaphorical way. While commenting on the technological environment, it also accommodates the requirements of the mass production process.

The physical effects of serial production on domestic products are obvious in some respects – like the use of mass production industrial materials and the fact that larger production volumes, as well as a higher rate of production, are possible. Rapid prototyping is just one of the technologies that contribute to significant time-saving in the mass production setting. In the mass produced jewellery context, there has been little marked change in the forms of the artefacts, but much change in the efficiency and volumes of the production environment. Other effects on the forms of the artefacts are difficult to measure. It is clear that there is an unparalleled freedom of form and the ability to explore much more curvilinear shapes and surfaces through up-to-date technologies. The designer does not need to quantify the geometry needed to describe these complex surfaces, as the technology does this for him or her. The need to reduce the product to a 2-dimensional representation during the design process has thus been eliminated, and the designer is able to consider the product in 3 dimensions at all times. This has contributed significantly to the greater freedom of form.

Products are rapidly dematerialising because of developments in electronics and production technologies. This means that a product, possibly housing little more than a microchip, can assume any identity or form. The designer, therefore, is responsible for projecting a suggestion of function of the product in the physical form, which houses the shrinking technological parts.

5.2 Ideas of Quality

After analysing the factors influencing product choice, it seems that there is no idea of quality communicated *directly* through the physical process of mass production. There are strong *indirect* links (especially in branding) in respect of domestic products, but

this is much less clear with regard to jewellery. Factors influencing product choice, such as ideas of environment, serial production processes, tactility, product semantics, branding and spiritual importance, all illustrate an indirect relationship to quality through serial production in various ways.

Forty's (1986) theory of ideas of environment shows an indirect link to serial production and quality. Consumers are surrounded by mass produced artefacts in the technologically driven society of the twentieth century. As manufacturing technologies continue to advance, many products are improving in quality. It is this environment (of better quality products), which contributes to the evolution of new products. Serial production processes are indirectly related to quality, however, in that they may contribute to the value of the product by facilitating cost-effectiveness in product manufacture, which may, therefore, result in a greater accessibility for consumers. It is thus possible that products may be more accurately produced, better finished and produced from better quality materials, thus improving the quality of the item. The indirect role of serial production in perceived quality can also be seen in tactility, as the choice of materials or surface finishes would largely be determined by the mass production technologies involved in the manufacture of the artefacts.

With regard to product semantics, it is clear that the role played by serial production is an indirect one, as the development of serial production technology has resulted in an increased freedom in the form of products. The quality assurance needed for successful branding is facilitated by the repetitiveness of manufacture using serial production processes, thereby illustrating an indirect relationship to quality. The mass produced artefact is a vehicle to deliver the idea of quality to the consumer. A well developed design theory or consideration of the spiritual aspects of a product, moreover, seems to produce an artefact that is perceived as valuable or of good quality. The spiritual importance of the mass produced artefact therefore also shows an indirect relationship to serial production.

In generally, jewellery consumers appear to be ignorant about serial production technologies, and it therefore seems unlikely that serial production would add value in

any way. They seemed quite content that the production techniques should remain part of the mystery or romanticism surrounding the jewellery process. The preference for handcrafted pieces of jewellery seems to relate more closely to a perceived sense of individuality, as discussed in Chapter 4, than a quest for accuracy. On this point, there was definite agreement among the group of jewellery consumers interviewed. They assumed that computer manufactured pieces were likely to be more accurate, precision pieces.

Perhaps what remains is to restructure the working environment of the jewellery designer in order to reduce the time pressure on him or her to allow time for reflection on design. Lost time in the current jewellery manufacturing environment is usually viewed as a loss in production and therefore a financial loss. What is needed, instead, is to create time for the designer, by implementing measures to separate the design and production processes. The use of more specific tooling, such as rapid prototyping technology, will facilitate this separation, allowing the designer more time to consider and refine the design process.

The fact that a direct comparison between the respective disciplines of jewellery and industrial design is difficult relates directly to issues of function. While the function for most products is obvious (for example, a kettle is used to boil a litre of water), and therefore an easily assessable feature of the object, this is not the case in jewellery design. Jewellery design can be described as the creative process usually preceding and including the creation of objects for personal adornment. Physical adornment or decoration indicates the wearer's social standing, cultural affiliation and status (see Chapter 1). Although the function of adornment is clearly recognisable, other factors such as status, social issues and cultural messages are more complex, and therefore difficult to assess. Because jewellery seems designated to communicate complex social messages, the wearer has higher expectations of the quality of the piece. In this instance, quality would not be defined in terms of precious materials or traditional craftsmanship, but rather as a match between the message of the jewellery and what the wearer wants to project or communicate. The communication of these messages, and

the fact that the piece will usually rest upon the skin of the wearer, are some of the factors that make a piece of jewellery such a personal and intimate artefact.

An important finding of this study is the fact that the sample of industrial designers who participated herein appeared to have a more developed sense of a personal design theory or philosophy than did the sample of jewellery designers. Most of the product designers referred to their design theories in the interviews, and moreover these can be easily found in the literature or on websites relating to their personal or company approach to design. The South African designers, in contrast, were far less focussed on design theory than their Italian counterparts. A distinctive, theoretical approach to design also seemed to be lacking among the jewellery designers working in a manufacturing context. The jewellery designers working in the highly pressurised mass manufacturing context generally have little time to consider issues such as design philosophy. Perhaps the product designers have a broader view of societal issues because context, market and environment are all contributing factors to the product design process. It is possible, then, that the jewellery designers have a narrower focus on their design context, because they are only concentrating on a smaller entity – namely, the human body.

Another possible reason for the successful design of domestic products may be their longer process of development, which involves many members of a product development team. This team, for example, often includes specialists in manufacturing technologies, materials, function or electronics. This creates further opportunities for the design to be refined before actual production of the artefact. In contrast, the jewellery designer may not operate in a team environment at the design stage, and consequently there would be less time for the development of the design.

5.3 Recommendations

The intention of the study was to ascertain whether abstract ideas of quality were communicated through serial production processes. As serial production seems to play only an indirect role, other factors must be considered. It *is* possible to create artefacts

that are desirable, in multiples. Design plays a significant role in the desirability of an object, in that the choice of form, materials, finish and colour, to name only a few factors, contribute directly to the message that is communicated. A plastic spice container may be more desirable than a glass one, simply by virtue of its design (even though glass is generally regarded as a higher quality material). Marketing of a product is also important: although an anonymous, well-designed product may earn recognition, this may take time, and a well-marketed product will be noticed earlier.

It was found that, there are avenues that the South African jewellery industry could explore in increasing their market. Branding, for instance, emerged as a very important factor in communicating quality. The profile of South African jewellery design could be raised generally, both locally and internationally. The jewellery industry would benefit greatly from the development of a South African brand of jewellery, potentially in conjunction with the Proudly South African campaign. The jewellery consumers interviewed in this study emphasised, however, that it would be important for this new identity to be separate from the curio jewellery market, as the latter has a very limited appeal.

It is also important for the South African jewellery industry to invest in new production technologies, including rapid prototyping equipment. This would facilitate the increased beneficiation of South Africa's minerals, and thus the growth of the jewellery industry. Tertiary institutions, too, should be mandated to set up monitoring and mastering of developments in new jewellery production technologies worldwide, and to communicate this information to the jewellery industry.

In the interests of educating an emerging generation of jewellery designers, it would be advisable to ensure that training is established and/or upgraded in new technologies at the higher education institutions. It is imperative that jewellery designers are trained in the rapid prototyping technologies that are playing such an increasingly significant role in the Italian jewellery industry as well as in the rest of the world. Students registered to study in jewellery design and manufacture, could also receive additional tuition in the field of business, marketing and/or anthropological studies, in an attempt to foster a

broader view of society and culture. Senior students should be encouraged to develop a personal design theory. This is important for the development of the jewellery industry. Furthermore, increasing investment in new technologies will mean that the separation of the design and manufacturing processes will allow for more time to be spent on design, reflection and experimentation, which are necessary for creativity.

5.4 Areas for Further Study

It is recommended that the same issues presented herein, which are related to perceptions of quality, be investigated further, but by including a larger sample of product and jewellery designers and consumers. The current sample is obviously biased towards the Western Cape jewellery industry. An in-depth and larger-scale study would provide a more substantial background for the development of a South African jewellery brand.

There clearly needs to be increased investment in the South African jewellery industry. With this in mind, a study could analyse current patterns of investment, and could therefore identify if there is a need for intervention to generate further investment in the South African jewellery industry. If there is consistent underinvestment, the reasons for this would need to be identified and examined. Alternatively, a study that analyses existing suitable business models would be able to identify which of these would best facilitate investment in the jewellery industry. This investigation could also include examining any existing incentives or assistance schemes at the South African Department of Trade and Industry. The availability of funds and appropriate procedures for accessing these resources should be communicated to all the relevant parties in the jewellery industry.

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APPENDIX A

DESIGNER AND COMPANY DETAILS FOR INTERVIEWS CONDUCTED IN ITALY

A. Italian product designers

B. Italian jewellery companies

A. ITALIAN PRODUCT DESIGNERS

These designers represent a broad cross-section of products – from lighting and furniture to smaller kitchenware and bathroom accessories. They also encompass a broad range of materials, and therefore manufacturing processes. All the companies represented seem to be successfully exporting some of their products.

NAME	COMPANY	DETAILS
	Alessi S.p.a.	Alessi was founded in 1921 by Giovanni Alessi, and the company produced metal household objects. Today, Alessi is a medium-sized family firm producing domestic products in a variety of materials. They are considered a leader in the design of household objects. They have about 200 employees at the factory in Crusinallo, where all the stainless steel work is done. All other parts are outsourced, and then returned for assembly at the plant. Alessi have no in-house designers, but have used about 200 designers to design around 2000 different items in the Alessi catalogue. The collaboration with external designers started in 1955, and include designers like

		Phillippe Starcke, Ettore Sottsass, Richard Sapper, Aldo Rossi, Michael Graves and Jasper Morrison. Alessi exports 65% of its products to over 60 countries (Alessi, 2005). Alessi's turnover from 1983 was 11 billion Italian Lire, and from 2000 was 184 billion Italian Lire (World Bank Institute, 2001).
Spini, Gregorio	**Kundalini Design S.r.l.**	Kundalini was founded in 1996. They are designers of products including lighting and furniture. They are well known for "Yoga" lamp. They export to Austria, Belgium, France, Germany, Holland, UK, Spain, USA, Canada and Mexico (Kundalini, 2005).
Silvio, Columbo	**Meritalia S.p.a.**	Founded in 1987, Meritalia now have 3 manufacturing premises for furniture (metal, upholstery and metalwork). They also employ high-profile designers like Dante Benini, Marc Newson, Gaetano Pesce. They export to Japan, UAE, Germany, UK, France and the USA.
Pedrizzetti, Paolo	**Paolo Pedrizzetti & Associati**	Pedrizzetti qualified in as an architect and started working in product design in 1978 with Davide Mercatali. He founded Paolo Pedrizzetti & Associati in 1988. They focus on new product development. Several products have been chosen to form part of the permanent exhibition of museums in Chicago, Il.; Munich, San Diego, Cal. and the Museo d'Arte

		Moderna in Florence. In 1993 a product was selected as part of the merchandising of the Museum of Modern art in New York (Everart, 2005).
Venturini, Guido	**Architect and product designer**	Born in 1957. Venturini has had many collaborations with Alessi spa since the late 1980s with Stephano Giovannoni. They were responsible for the "Girotondo" figures that have grown to be the largest "family" of Alessi products – including kitchen utensils and office stationery (Alessi, 2000: 178). Venturini has a wide range of clients, including Une a Erre jewellery manufacturers.

B. ITALIAN JEWELLERY COMPANIES

The companies chosen include representatives from two important jewellery manufacturing regions in Italy; namely Vicenza (site of the annual jewellery trade fairs) and Valenza. Two companies represent middle income target markets in a larger scale manufacturing setting, and the remainder have a target market of middle to upper income groups. All have been successful in exporting their jewellery.

NAME	COMPANY	DETAILS
Livia Balocchi (MD, designer and Production Manager) Emanuele Romano (Sales Manager)	**Balocchi Preziosi s.r.l.**	The company was founded in 1993. Livia has more than 10 years experience in the precious and semi-precious stone market; she is a trained gemmologist. Approximately 50% of production is exported to the USA, Europe and the Middle East (Voguegioiello, 2001).
Kira Garavelli (Manager)	**Garavelli Aldo s.r.l.**	Founded in 1920, Garavelli targets the middle to upper income earners. Their exports to the USA, UK, Japan and South America form about 90% of production. Garavelli is based in the town of Valenza, an important jewellery manufacturing area (Voguegioiello, 2001).
Randazzo Corrado (owner and designer)	**Li Ori**	The company is situated in Valenza. Li Ori produces jewellery from 18k gold, diamonds and pearls. There are 12 employees in the factory, which also manufactures for Bulgari and Pomellato. Li Ori also exports to Japan.
Luigi Bon (owner and designer)	**New Silver s.n.c.**	New Silver was founded in 1971. They employ 22 to 25 people on the site, but also outsource some work. They are

		based in Vicenza, an important area for jewellery manufacture and site of the major jewellery fairs. They supply wholesalers and also produce jewellery for some well-known companies like Pianegonda. New Silver exports to the USA, Spain, France, Germany and Brazil.

APPENDIX B

DESIGNER AND COMPANY DETAILS FOR INTERVIEWS CONDUCTED IN SOUTH AFRICA

A. South African product designers

B. South African jewellery companies

A. SOUTH AFRICAN PRODUCT DESIGNERS

These designers represent a broad cross-section of products – from aluminium garden furniture to plastic wind-up radios. Again, this broad range of products represents a wide range of materials and processes. Companies range in size from small to medium, and ...xyz was felt to be significant, as a result of their involvement in design education development. The companies have designed domestic products that are exported.

NAME	COMPANY	DETAILS
Gagiano, Mark (Product Design Manager)	**Freeplay Energy Plc.**	The company was founded in 1994. Gagiano has 8 years of experience, and has worked for Freeplay Energy Plc in South Africa and London. Freeplay focuses on technology research and product development. They are known globally for their wind-up radios. (Freeplay, 2005)
Swanepoel, Adriaan (Owner and Head Designer)	**This Way Up Product Design c.c.**	This Way Up was founded in 1996. Swanepoel has 13 years of experience in industrial design. The company does consulting work for various manufacturers in the Cape Town area (mostly manufacturing for export). The main focus areas are plastic injection moulding, aluminium casting and the

		design of electronic equipment.
Mulder, Roelf (Managing Director and Designer)	**...Xyz**	The company was founded in 2000 in Cape Town. Mulder has more than 20 years experience in the industrial design and development industry. The in-house team includes industrial designers, mechanical engineers, industrial engineers, graphic designers and prototyping technicians. They work with small and medium enterprises (including Shell International, First National Bank, The Freeplay Foundation and Mercedes Benz). Roelf is actively involved in the academic development of design education in South Africa. (...Xyz, 2005)

B. SOUTH AFRICAN JEWELLERY COMPANIES

The companies chosen were in the Cape Town area. They have target markets that range from lower income to upper income groups. Three of the four companies are successfully exporting jewellery, and are important role-players in the South African jewellery industry.

Donald Greig (Manager and Designer)	**Charles Greig Jewellers**	The company was established in 1899 by Charles Greig in Johannesburg. There are now 5 branches in South Africa. They cater to the upper end of the market. They employ 17 – 20 people in several workshops in Cape Town. The market is 50 – 60% foreigners, but they are aiming to capture more of the 25 to 30 year olds and then 35 to 45 year olds of the local market.
Stuart Benade (Senior Designer)	**Galaxy and Company Manufacturing Jewellers**	The company was established in 1930, and now employs 60 to 200 people. There are 88 stores in South Africa (part of the Mr Price group), of which, there are 15 to 20 stores in the Western Cape. They cater for the middle to lower income groups.
Martin Ammann (Design and Development Manager)	**Oroafrica**	The company was founded in 1945 in Johannesburg. They now employ 160 staff members. The head office is in Cape Town. Ammann has more than 12 years experience as a fine jewellery designer. Oroafrica caters to the middle to upper end of the market. They also export to USA, Europe (including the UK) and

		sub-Saharan Africa. In 1998 they entered a joint venture with the Italian company Filk Spa, the world's largest chain producer. Oroafrica is the largest jewellery producer and exporter in Africa (Oroafrica, 2003). Oroafrica was proposed as a founding member of the Export council (Kaiser Associates, 2002).
Ruth Louwrens (Designer) Antonietta Murtas (Jewellery consultant)	**SA Link Jewellery**	SA Link has close to 100 employees, and supplies American Swiss, Sterns and chain stores like Truworths and Macro. Their target market is the middle to lower income groups. They are one of the largest jewellery exporters and manufacturers in South Africa. SA Link was proposed as a founding member of the Export council (Kaiser Associates, 2002)

APPENDIX C

DETAILS OF CONSUMERS INTERVIEWED IN SOUTH AFRICA

While the study group was small, it was felt that more qualitative information would be gleaned in a one-to-one interview situation than in a focus group. The size obviously limits the findings, but the sample could be expanded in further research. The jewellery manufactured for export usually falls within the same target market as current production. Therefore the local consumers have valid opinions. Alternatively, one would need to seek an agent in an appropriate export target country, to ascertain views of foreign potential clients.

NAME	INCOME GROUP	JEWELLERY STORES	TARGET FOR LOCAL COMPANIES
S. Clement	Upper income	Olga, Schwartz, Uwe Koetter	Oroafrica Charles Greig
K. Futter	Middle income	American Swiss	Galaxy and Co. Oroafrica
P. Goodall	Upper income	Uwe Koetter, Thomas Kader	Oroafrica Charles Greig
J. Noordien	Lower income	Galaxy and Co., Game	Galaxy and Co. SA Link
M. Thiessan	Lower to middle income	American Swiss, Truworths	Galaxy and Co. Oroafrica SA Link

APPENDIX D

GUIDELINES FOR INTERVIEWS CONDUCTED IN ITALY AND SOUTH AFRICA

A. Interview Outline: Design in Italy

(Used for interviews with Product and Jewellery designers in Italy)

B. Interview Outline: Product Design in South Africa

(Focus on companies with premises in South Africa)

C. Interview Outline: Jewellery Design in South Africa

(Focus on jewellery designers in a manufacturing context in South Africa)

D. Interview Outline: Jewellery Consumer in South Africa

(Focus on South African jewellery consumers within a specific target market)

A. INTERVIEW OUTLINE: DESIGN IN ITALY

(Used for interviews with Product and Jewellery designers)

Company Name:

Address:

Contact:

Position:

(eg. Sales manager, designer)

1. What do you feel is unique about your work?

2. Do you think that your work is particularly "Italian"? In what way?

3. Do consumers in the rest of the world buy "Italian" design or "good" design?

4. What technological processes/production techniques do you use in the production of your designs?
   (for example: laser cutting; CAD/CAM technologies)

5. Does the use of these technologies influence your design in any way?

6. Do you feel that production technologies limit the creativity of your work?

7. Do you think that these technologies add to the value of the item?

8. What materials do you work with?

9. Are they valuable on their own/ in their raw state?

10. Does "design" or "technology" make them valuable to the consumer?

11. What is it that makes the item "desirable" - makes a person choose *this* one, and not another?

Thank you for your time.

B. INTERVIEW OUTLINE: PRODUCT DESIGN IN SOUTH AFRICA

(focus on companies with premises in South Africa)

Date:

Company Name:

Address:

Contact:

Position:

(eg. Sales manager, designer)

1. What do you feel is unique about your work?

2. Do you think that your work is particularly "South African"? In what way?

3. Do consumers in the rest of the world buy "South African" design or just "good" design?

4. What technological processes/production techniques do you use in the production of your designs?
   (for example: laser cutting; CAD/CAM technologies)

5. Does the use of these technologies influence your design in any way?

6. Do you feel that production technologies limit the creativity of your work?

7. Do you think that these technologies add to the value of the item?

8. What materials do you work with?

9. Are they valuable on their own/ in their raw state?

10. Does "design" or "technology" make them valuable to the consumer?

11. What is your current biggest market in South Africa?

12. What is your current biggest market internationally?

13. What is it that makes the item "desirable" - makes a person choose *this* one, and not another?

Thank you for your time.

C. INTERVIEW OUTLINE: JEWELLERY DESIGN IN SOUTH AFRICA

(Focus on jewellery designers in a manufacturing context)

Company Name:

Address:

Contact:

Position:

(eg. Sales manager, designer)

1. What do you feel is unique about your work?

2. Do you think that your work is particularly "South African"? In what way?

3. Do you export any of your jewellery?

4. Do consumers in the rest of the world buy "South African" design or "African" design or "good" design?

5. What technological processes/production techniques do you use in the production of your designs?
   (for example: casting; CAD/CAM technologies; laser cutting)

6. Does the use of these technologies influence your design in any way?

7. Do you feel that production technologies limit the creativity of your work?

8. Do you think that these technologies add to the value of the item?

9. What materials do you work with?

10. Do you work with any non-precious materials?

11. Does "design" or "technology" make them valuable to the consumer?

12. What is your current biggest market in South Africa?

13. What would be your target market for expansion in the **export** market? (specifically age and economic status)

14. What would be your target market for expansion in the **local** market? (specifically age and economic status)

15. What is it that makes the item "desirable" - makes a person choose *this* one, and not another?

Thank you for your time.

D. INTERVIEW OUTLINE: JEWELLERY CONSUMER IN SOUTH AFRICA

(Focus on jewellery consumers within a specific target market)

Name:

Address:

Contact number:

1. How often do you buy jewellery?

2. What kind of item do you buy (eg bracelet, chain, earrings) and what kind of material (white gold, 9kt, silver, precious stones)?

3. Where do you shop most frequently?

4. Do you look for South African designs or designers? Alternatively, do you look for international/European trends?

5. Do you/would you shop according to a brand name in clothing? (which ones?)

6. Swatch, for example, has extended their range from watches only into jewellery. Do you/would you shop according to a brand name in jewellery?

7. The Italians, for example, have many well-known jewellery brand names (eg. Bulgari, Pianagonda). Do you think there should be more South African brands in jewellery?

8. Are there any existing brands/manufacturers of which you are aware?

9. Are you familiar with any of the processes/production techniques used to make the items in your home?
   For example: a kettle, a plastic bowl, and furniture?

10. Are you aware that many of these products are made almost entirely by machine, be it from computer drawings to mouldings, machining and polishing?

11. Do you feel that products made in a factory are better quality and/or finish than those made by hand?

12. Are you familiar with any of the processes/production techniques used to make jewellery?
    (for example: casting; CAD/CAM technologies)

13. Do you think that the accuracy of manufacture using computer technology would make jewellery more valuable or of better quality/finish than those made entirely by hand?

14. Do you think that there is something special about handmade jewellery?

15. Should one advertise the way that jewellery has been manufactured?

16. Should one develop a brand related to manufacture techniques?

17. Does "design" or "technology" make the jewellery valuable to the consumer?

18. What are the most important concerns when purchasing jewellery: design, cost, material or manufacture?

Thank you for your time.

APPENDIX E

OUTLINE OF SERIAL PRODUCTION TECHNOLOGIES

A. CASTING

1. Sand casting
2. Investment casting
3. Centrifugal casting
4. Die casting

B. CUTTING

1. Blanking
2. Punching
3. Piercing
4. Laser cutting

C. METAL FORMING

1. Roll forming
2. Metal spinning
3. Deep drawing
4. Pressing

D. PLASTIC MOULDING

1. Blow moulding
2. Injection moulding
3. Extrusion

E. CNC SYSTEMS

F. RAPID PROTOTYPING

1. Stereolithography
2. Fused deposition modelling (FDM)
3. Inkjet based systems
4. Electroforming

G. ROBOTICS

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SERIAL PRODUCTION TECHNOLOGIES

A. CASTING

This process involves pouring a material (usually molten metal, but could also be resin or other materials) into a cavity having a desired shape. The main advantage of this method is that parts with complex internal cavities can be manufactured, as this is challenging using other production techniques. The size of the parts to be manufactured varies greatly.

1. Sand Casting

This method is widely used because it is simple. The moulds are also inexpensive and are used for small series production. This method is the most direct way to transfer the pattern to the casting, and has few shape, size or weight constraints.

The mould is made of sand. Specific binders and additives are combined with sand to make a mixture to be used as the mould material. A pattern is made from wood, metal or plastic that has the desired shape to be cast. The sand is then compacted around the pattern to create a mould. The positive is removed, and molten metal is poured into the cavity. After moulding the part can be removed and cleaned. The mould is destroyed (a waste mould). Machining may be required for rough surfaces. Cast iron, steel and aluminium are used in sand casting.

2. Investment Casting

This method produces parts with excellent surface finish and high accuracy, with no release angles or parting lines. It can accommodate asymmetrical and unusual shapes. Also known as the "lost wax" method, this is one of the oldest methods of casting; the ancient Greek population used this technique to create large bronze sculptures, among other things.

The positive is made from wax, and then coated (invested) with a layer/s of a material that can withstand high temperatures. After this refractory material has set, the wax is melted and poured out of the mould. This leaves a cavity in the shape of the original positive. The mould is preheated close to the pouring temperature of the metal, and then the molten metal is poured. In the case of jewellery production, the metal is often poured in a vacuum chamber, to minimise air bubbles (porosity) in the metal. It is a waste mould process i.e. the mould must be broken to release the cast object.

The mould can be made of materials such as plaster of paris or ceramic compounds. Unfortunately the size of the object to be cast is limited by the size of the vessel or container that will hold the positive and mould material. Materials like steel, sterling silver, platinum and gold can be used for investment casting.

3. Centrifugal casting

This process creates a shape that is naturally hollow, thus eliminating the need for a core in the mould. The mould is housed in such a way (horizontal or vertical) that it can be rapidly rotated as the molten metal is poured into the cavity. The centrifugal force created ensures that the molten metal spreads into all areas of the mould cavity.

4. Die Casting

This process is used to manufacture highly accurate complex-shaped parts. They can be very thin-walled, and have excellent surface finish and details. Die casting can facilitate high production rates.

The mould used in this type of casting is made of metal in two parts. The die is made of tool steel, and can have more than one cavity (to facilitate casting more than one item in one casting) as well as moving parts (to facilitate the release of the part). The molten metal is injected into the cavity at a high pressure, instead of being gravity poured. The mould is opened once the metal has cooled and solidified. Aluminium, magnesium, zinc, tin and lead are among the metals used for this process.

B. CUTTING

One of the most useful operations to convert sheet metal or strip into useful items (flat shapes) is the process of cutting. Cutting processes usually involve low tooling investment but a high wastage of material. Blanking, punching, piercing and laser cutting are used in a production setting; this is a basic but essential step in the forming of an object.

1. Blanking

A die is created for the desired shape. The die is used to cut the shape out of the sheet metal, and the hole material is saved for the next process i.e. all the material *around* the shape is scrapped.

2. Punching

The die-making process is the same as in the blanking process, but the hole material is the material which is scrapped i.e. the material around the shape is saved for further operations.

3. Piercing

Piercing is the process of cutting of holes in a sheet material using a round die (which usually creates quite small holes). This process becomes known as perforating when the holes are small and fairly close together.

4. Laser Cutting

Laser cutting is very accurate and shows little thermal distortion, and so can be used for cutting very small holes or thin slots. It can be used for many materials, most often sheet metals, but can include plastics.

A laser beam is formed when certain chrystals and gasses are stimulated electronically, and light energy is created. This light energy is enhanced and focussed into a coherent beam of light. This light beam becomes the cutting tool. This method can be used to manufacture saw blades, as well as putting slots in stainless steel tubing.

C. METAL FORMING

Sheet metals can form a variety of shapes by applying physical force. Roll forming, metal spinning, deep drawing and pressing all make use of sheet metal. These processes usually involve a relatively high tool investment. However, high production volumes are possible using metal forming techniques.

1. Roll Forming

This includes the processes of roll bending and cold roll forming. The roll bending method forms curved shapes, cylinders and rings. Cold roll forming allows for the formation of complex shapes from flat strip by a series of rolling operations, each becoming part of the final shape. Building trims, rain gutters and channels created using this process.

2. Metal Spinning

The process of metal spinning allows for the formation of cylindrical, tapered or curved shapes from sheet material. A disc of metal (usually formed by blanking) is rotated and forced against a chosen form. There is no intention to alter the thickness of the piece, merely to form it into a round shape.

3. Deep drawing

Deep drawing forms a flat piece of metal sheet into a hollow shape, by applying force with a punch in the middle of the metal. The metal is drawn into the die cavity by the punch. There is stretching of the metal as it is formed, usually in a series of progressively deeper dies. Each die contributes gradually to the final shape of the object. Deep drawing can be used to form relatively complex shapes.

4. Pressing

Pressing is the process of forming sheet metal between two halves of a die i.e. a male and a female part. The top plate of the die is attached to a press ram, which moves the die towards and away from the other half of the die. Large parts such as car parts can be

manufactured using this method. Pressing usually involves shallower forms than deep drawing.

D. PLASTIC MOULDING

Plastics have changed our world completely. Advances in the technology used to manufacture and process plastics have spawned an almost limitless array of products. Key technologies used in forming plastics are blow moulding, injection moulding and extrusion.

1. Blow Moulding

This method is used to create hollow shapes of all sizes. A mould is created in the shape of the desired object. A molten plastic tube (parison) is inserted in the top of the mould, the mould closes and the parison is clamped in position. Warm air is then forced into the tube, pressing it against the sides of the mould. The finished piece is removed by opening the mould once it has cooled. Materials used in blow moulding include PVC and ABS plastics. A bottle, for oils/solvents/beverages, would be a typical product.

2. Injection Moulding

This method is excellent for items that require a high level of finish and detailing and possibly complex shapes. It is usually limited to thermoplastics. A metal die is created with a cavity (or many cavities) for the desired product. Plastic, in granular or small pellet form, is heated until it is molten, and then injected into the mould cavity. Once the plastic part has cooled and solidified, the die is opened and the part is released.

3. Extrusion

This process is used to create products with a profile of almost any shape. Most plastic materials can be used in this process. The plastic is heated as it is forced through the die with the shape of the profile. Usually an extruder screw facilitates the mechanical pressure needed to force the material into the die. The profile is then cooled and cut to lengths required.

E. CNC SYSTEMS

Computer numerical control (CNC) plays an important role in the automation of many manufacturing processes. Numeric instructions control the equipment and, therefore, processes by electromechanical or hydraulic means. CNC system operations include positioning the piece or the cutting tool, selecting the correct tools, changing tools and accomplishing the required operation using the correct speed and feeding settings. These systems are particularly useful in laser cutting operations.

F. RAPID PROTOTYPING

This is a term that encompasses a group of technologies that use CAD data sources to create physical objects. Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) systems have come to play a pivotal part in the manufacturing environment. The information needed for design and production may now be fed into the production stations directly. Instructions for a new model to be machined may arrive by email. The main technologies used to create the prototypes are stereolithography, fused deposition modelling, inkjet based systems and three dimensional printing. Electroforming is also included as it is an important technology for building *flat* shapes.

These methods all involve the building up of layers of material that are bonded together to form the object, as opposed to the traditional methods of milling or turning, which take material away from the original starting shape. This eliminates the need for complex assembly or machining, any object can be easily formed, and the process is fairly fast. The materials can vary, including wax, metal and plastics.

1. Stereolithography

The excellent surface finish and accuracy afforded by stereolithography ensures that it is one of the most widely used forms of rapid prototyping. Parts are formed in acrylic and epoxy.

This technology builds an object by creating layers from a liquid plastic material. A CNC-controlled laser beam is traced on the surface of a vat of liquid polymer, and where the beam strikes, the material solidifies. Once the first layer is complete, it is lowered a little distance into the vat of liquid and the second layer is traced on top of the first, thereby building many layers to form the object. The material is self adhesive, so the object formed is completely solid. The model is lifted out of the vat when it is complete, and any supports will be cut off.

2. **Fused Deposition Modelling (FDM)**

Materials that have been successfully used for FDM include ABS and investment casting wax, and more recently, polycarbonate. The surface finish is good, but unfortunately the detail is not as fine as what is achieved with stereolithography.

This method uses solid plastic, which is melted and applied in layers, until the model is complete. The plastic material is fed into an extrusion nozzle, which is heated in order to melt the material. The nozzle also has a mechanism to control or stop the flow of the plastic. A mechanical stage houses the nozzle, and can be moved vertically and horizontally as it follows the path in the required pattern. A thin bead of extruded plastic forms a thin layer, and hardens immediately as it leaves the nozzle, as the chamber is kept at a temperature just below the melting point of the material. Each layer adheres to the one below, creating a completely bonded model. Any support structures are removed when the model is complete.

3. **Inkjet based Systems**

Inkjet-based systems have a very fine resolution surface finish equivalent to that of CNC machines. This finish does, however make the creation of large objects a very slow process. Despite these constraints, the technique is used for casting patterns, concept models and jewellery.

This machine works in a similar manner to the FDM machine, but has two reservoirs, one for the plastic build material, and one for a wax-like support material. It also uses many jetting heads in the process, as opposed to just the one nozzle used in FDM. The

reservoirs store the materials in a melted liquid state before being fed to the jetting heads. These heads then deposit little droplets of the material on the surface, as they move around on X- and Y-axes. The material hardens as soon as it is deposited, as the temperature is much lower. Once one layer of material is complete, a milling head moves over the whole surface, to ensure a constant thickness. This process of depositing and milling is repeated until the whole object is complete. The wax supports are easily removed once the article is complete.

4. Three Dimensional Printing

This technology builds a model by creating layers from a powder material, which is bonded by a liquid adhesive. This process is the one of the fastest for object fabrication, and the materials cost is fairly low. It is used as a means of direct manufacturing as well as for prototypes.

A layer of powder is deposited at the top of the fabrication chamber, and is then compressed. An inkjet head then deposits the liquid adhesive on the powder layer in the required pattern. In the areas where the adhesive is deposited, the powder becomes bonded and forms the first layer of the model. The base of the fabrication chamber then moves down by the thickness of the first layer, and the process of applying powder and then adhesive continues until the model is complete. The chamber base is then raised, and the extra powder is brushed away from the finished model.

5. Electroforming

This process provides a cost effective and high precision alternative to laser cutting, punching or etching. There are no burrs and excellent edge definition, so no further machining or finishing is required.

This process of electroforming builds a flat object by the electro-deposition of metal molecules on a substrate. A photo-sensitive coating is applied to a specially textured and prepared metal substrate. The pattern is transferred by exposure to UV light, and the used photo-resist is rinsed off. There is now the electro-deposition of metal molecules (often nickel) onto the substrate in the areas exposed (with no photo-resist).

The completed shape is then separated from the metal substrate, and is ready to be used or reproduced.

G. ROBOTICS

The field of robotics is advancing all the time; and while seeming to supplement the ordinary workers, the robots actually contribute greatly to the efficiency of the manufacturing environment. A robot is a "fully automatic device that can accomplish a specific task such as assembling or unloading parts in a machine tool" (Bruce et al. 1998: 434). Robots can work 24 hours a day and perform a wide range of tasks with the appropriate computer programming. Sensors facilitate the feedback and monitoring of information and progress in a robotic system.