Sustainable Design Approaches Using Waste Furniture Materials for Design Practitioners

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Abstract

Sustainability has become one of the core concerns of 21st century designers and makers. However, it is still evident that not every designer considers a choice of sustainable materials, manufacturing methods, afterlife or second use of their designs for furniture and other products unless the client, brief, customer or user demands it.

This research stemmed from a curiosity of the recycling practices of domestic households in England, the author's country of residence, and investigates how designers can make use of post-consumer waste. The lack of established research for practice-based design practice with waste materials for designers has led to the development of a naturalistic approach within this work which is both craft-based and commercially focused. The central aim of the study is to explore how designs are sustainably approached in the commercial context of young furniture design companies in the UK, and to propose a set of practical guidance through design outcomes to help young entrepreneurs to deal with environmental issues via design and waste material reuse. This study functions as an articulation of the research journey that provides a discursive platform for dialogue and review, facilitating new insights into creative practice that contributes to new knowledge by efficiently crafting objects in a commercial context using discarded materials. This then proves that this form of waste can be adaptable and practicable as a main material for upcycling into commercial products in repeatable batch production runs.

Primary research, including design exhibitions and interviews in order to inform the debate on environmental issues concerning furniture and products design, has formed a significant platform for a series of design and make responses. In addition, surveys have been conducted so as to compile the appropriate statistics and practical case studies of furniture and products produced through environmentally sensitive methods have been carried out. The primary case study for this will be Furniture Magpies,[1] a furniture design and making company which the author co-founded as a member of the cooperative enterprise. As this research is practically driven, the final result has been demonstrated not only in this document but also through the production of a furniture and product collection to help gain a practised understanding of reusing elements of furniture waste as a primary material source and make creative connections through a structured process of reflection and discussion on practice.

This work may inspire designers and makers to reconsider the use of waste materials in their practice, to discover the beauty and usefulness of these materials, and through a structured design process using the guidelines make attractive commercial products, raise awareness of material reuse, and make a positive impact on the environment.

[1] Founded by author and two MA Furniture Design graduates from Bucks New University in 2011

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Abbreviations

UNEP (United Nations Environment Programme)

WRAP (Waste & Resources Action Programme)

CO2 (Carbon Dioxide)

Defra (Department for Environment Food and Rural Affair)

ELV (End-of-Life Vehicles)

LCA (Life Cycle Assessment)

DDT (dichlorodiphenyltrichloroethane)

UN (United Nations)

NASA (National Aeronautics and Space Administration)

WWF (World Wildlife Fund)

3R (Reduce, Reuse, Recycle)

GPP (European Commission Green Public Procurement)

FRN (Furniture Re-use Network)

UEA (EUROPEAN FURNITURE MANUFACTURERS Association)

BWF (British Woodworking Federation)

DfE (Design for Environment)

ESD (Environmentally Sustainable Design)

C2C (Cradle to Cradle)

PCSO (Police Community Support Officers)

GHG (Greenhouse gas)

BRIC (Countries of Brazil, Russia, India and China)
USA (United States of America)
CNC (computer numerical control)
PET (Polyethylene terephthalate)

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Author’s declaration

I declare that this thesis and the work presented in it are my own and have been generated by me as the result of my own original research.
I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University.

2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated.

3. Where I have consulted the published work of others, this is always clearly attributed.

4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.

5. Where elements of this work have been published or submitted for publication prior to submission, this is identified and references given at the end of the thesis.

6. This thesis has been prepared in accordance with the Coventry University and Buckinghamshire New University.

7. I confirm that if the submission is based upon work that has been sponsored or supported by an agency or organisation that I have fulfilled any right of review or other obligations required by such contract or agreement.

Sua Lee

Chapter 1. Introduction

We are living in a world surrounded by waste, no matter how hard we try to reduce, reuse, and recycle, or how often we see waste mountains on the land and in the sea. This has provoked many designers to consider how we can solve this global environmental issue. From the author's work in furniture and product design over the last 10 years, a view of design has emerged that has moved towards being environmentally concerned, looking to make designers responsible for their waste, and reduce the amount of waste going to landfill.

These days, people are increasingly living surrounded by waste despite efforts to prevent this by reducing, reusing, and recycling. The media still regularly shows mountains of waste. This fact has provoked the author's curiosity to take on this practical research from a designer's viewpoint. From the author's ten years of study around furniture and product design, her view of design has moved towards a more environment-friendly approach, as she believes designers bear some responsibility for the escalation of waste. As a group, designers have created numerous products that end up in landfill sites.

> 'There are professions more harmful than industrial design, but only a very few … by creating whole new species of permanent garbage to clutter up the landscape, and by choosing materials and processes that pollute the air we breathe, designers have become a dangerous breed. In this age of mass production when everything must be planned and designed, design has become the most powerful tool with which man shapes his tools and environments (and, by extension, society and himself). This demands high social and moral responsibility from the designer (Papanek, 1985, p.ix).

What if we, as designers, are actually producing more waste and encouraging consumption in the name of sustainable, eco, green, or zero waste design? We live in a 'buy and sell' society and consumption is just part of life but we need to be more careful about what we are producing. The desire for new products is not going to change and consumerism will not stop. This study has been established to seek out a solution to a current waste issue as a practitioner, designing products to respond to that issue.

1.1 Personal Rationale for Research

The foundation of this study was the personal experience of the author whilst completing her undergraduate course in Furniture Design and Related Product Design. At that time, the author believed subversion – to destroy and damage normality and make design changes with new ideas that reflected the trends of the period – was a fundamental driver for contemporary design. For example, the author was captivated by the fact that ordinary everyday objects can be used in different ways, retaining their beauty without using new materials or technology, as in the Chest of Drawers by Tejo Remy, as seen in Figure 1.

Figure 1 – 'You Can't Lay Down Your Memory' Chest of Drawers, made of found drawers held together roughly by a belt (By Tejo Remy, 1991, MOMA)

During the author's postgraduate studies in Furniture Design and Technology, the content of the course encouraged her to investigate the possibility of no-cost design. This was initiated from personal curiosity about the differences in waste handling[2] between two countries: England, where she was residing and South Korea, where she was originally from. As a design practice, an investigation was carried out on reusing waste material for a better environment. However, the results indicated that no-cost design is not possible, as various types of costs simultaneously occur, such as financial, environmental, time, and emotional costs.

The previous findings from these studies became the foundations upon which the author set up her own business, Furniture Magpies, with two friends in 2010. The motivation behind the company was to achieve a real and positive impact on the environment by reusing waste. The company specialised in regenerating old furniture that had been discarded (due to outdated aesthetics or damage) to create new pieces that both respected the environment and appealed to contemporary consumers. Unwanted furniture was prevented from going to landfill sites and its worth was also preserved. From 2010 to 2012, when the company's products were displayed at the Tent London design show (where newly established design groups often exhibit), Furniture Magpies had great success, with big retailers like Selfridges and Anthropologies placing orders. However, the company soon experienced a decrease in sales and had a difficult time recognising that the business was not only about producing well-designed products or ensuring they were good for the planet, but also about managing the entire process of running a firm.

[2] In 2009, waste bins encouraged the public to recycle basic rubbish such as glass, plastic, and paper, but it was not strictly monitored by the council at that time (High Wycombe). Whereas, in South Korea, entire household waste recycling was monitored by caretakers in each apartment block and people were fined if the recycling had not been done properly or had not been cleaned when it was taken to the recycling bins. Also, South Koreans had to purchase a specific bag for food waste, which was the only possible way to discard food waste by law.

The problems and observations made by Furniture Magpies inspired the author to investigate new entrepreneurs, such as herself, working with material reuse, and, through this study, discover beneficial approaches and solutions that might help to encourage other designers to exploit waste materials. It was hoped that the study could also generate new business models and advice for similar businesses by considering common issues faced by similar businesses and solutions that have been adopted.

1.2 External Rationale for Research

Al Gore[3] works tirelessly on numerous non-profit projects focused on finding solutions to our climate crisis, and voices the fact that the human species is confronting a planetary emergency (Novel Lecture, Gore, 2007). So, why has this issue become so urgent? Before the Industrial Revolution, most products were made by hand and based on craft skills, making use of natural raw materials, but with the change from manual to mechanical systems, more resources were required to produce large volumes of goods that have been beneficial to economic output. On the other hand, the environment was suffering. 'Since the mid-18th century, more of nature has been destroyed than in all prior history' (Chapman, 2006, p.7). Unfortunately, people had not realised that this kind of life pattern demanded more energy and used large quantities of the planet's resources. Thus, instead of creating a better and more convenient life, the Earth has suffered because of human beings. The influences of humanity are apparent through global climate changes, air and water pollution, resource depletion, ozone layer destruction, over-population, and waste.

There have been many fundamental changes in environmental thinking in recent years; it has been a busy and challenging environment for industry as everything has changed so rapidly. Economic growth has been the priority of much of the world, and, especially in the USA and in BRIC (Brazil, Russia, India and China) countries, such growth is being attained by increasing production and consumption. In consequence, we are currently facing an ever increasing number of damaging environmental issues. According to the United Nations Environment Programme (UNEP), there have been dramatic changes over the last 25 years in the global environment in areas such as population growth, industrial emissions, temperature change, and waste disposal and treatment that demand immediate attention. The expansion of the human population and its growing resource consumption causes an increase in the amount of waste, more greenhouse gases, and associated issues that have contributed to the environmental issues we are facing currently. The most recent official document available at present from UNEP (2016) shows that the impact of global production is still growing and that waste is constantly increasing:

- In 2014, global plastic production exceeded 311 million metric tons, a 4.0 percent increase over 2013. In 2010, out of 2.5 billion metric tons of solid waste generated by 192 countries, about 275 million tons consisted of plastic. It has been estimated that between 4.8 and 12.7 million tons ended up in the ocean

[3] Former Vice President of United States and a powerful environmental activist, journalist and chairman of The Climate Reality Project

As a solution, professions related to environmental subjects have uncovered problems that the planet is facing and legislation on waste has now been widely introduced to many countries through conferences and conventions such as The Basel Convention, [4] Agenda 21, [5] and Kyoto Protocol. [6] These international agreements are intended to solve the environmental problems of the earth through the commitment of individual countries' governments. Governments around the world have worked hard to implement and suggest more effective ways to save the planet for the future. Despite all efforts, the impact on the planet will not disappear or decrease unless decisive action is taken on waste creation.

- In 2012, according to the Waste & Resources Action Programme (WRAP), an estimated 670,000 tonnes of furniture are disposed of by householders in the UK annually, which means about 10 million items of furniture are thrown away in the UK every year; 3 million of these items could be easily re used and more could be repaired. An astonishing 7 to 10 million individual pieces of furniture still go to landfill.

This figure is very high and both individuals and businesses must produce fewer emissions and less waste to either maintain the condition or decrease the adverse effect on the planet. The waste is one of the main problems t causing environmental issues, yet it is one of the most approachable issues that can be resolved by individuals such as waste recycling by household. To be included in this, furniture and product designers, among many other professions, have contributed to the present situation through their use of materials and designs that have a definitive life or function like Piet Hein Eek, [7] Michael Marriot, [8] and Tom Dixon. [9] To investigate beneficial design and take opportunities to use waste in designers' practice, which would be a beneficial approach. Encouraging more design entrepreneurs' participation in material and waste reuse can positively impact on the environment and help change the public's view of waste when waste products are available in suitable forms and quantities.

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[4] The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted on 22 March 1989 by the Conference of Plenipotentiaries in Basel, Switzerland, in response to a public outcry following the discovery, in the 1980s, in Africa and other parts of the developing world of deposits of toxic wastes imported from abroad (www.basel.int).

[5] Agenda 21 is a global action plan for sustainable development into the 21st century. Sustainable development is a process that aims to meets the needs of the present generation without harming the ability of future generations to meet their needs (Agenda 21: Programme of Action for Sustainable Development, Volume 3 Number 2 - June 1999).

[6] The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change, which commits its Parties by setting internationally binding emission reduction targets (www.unfccc.int).

[7] Piet Hein Eek developed the iconic Scrapwood Collection in reaction to the problems created by traditional mass manufacturing. Working with reclaimed materials, he turns potentially wasted offcuts into desirable pieces of modern furniture with artisanal appeal. SCP. Sep.2017

[8] Tom rose to prominence in the mid-1980's as 'the talented untrained designer with a line in welded salvage furniture'. Design Indaba. Sep. 2017

[9] A keen reader of design history, Marriott is known for an open spirited kind of work that often makes use of pre-existing materials, manufacturing techniques or reclaimed objects.

SCP. Sep.2017

1.3 Scope and Limitations

This investigation is conducted to determine practical approaches to current environmentally friendly designs and designers, and the perceptions of design microbusinesses and young design groups and consumers in the UK between 2011 and 2017. The aspects considered are current waste issues, the perception of consumers on products' use waste materials, contemporary designers, and products that are friendly to the environment, the problems of designers who are running their business using discarded materials, and proposed suggestions for solving problems through design practice.

Although the research has reached its aims, there are some unavoidable and intended limitations. In part one: contextual review in practice, this study examines designs that were produced to see how the contemporary historical sustainable approaches of today are applied. It looks into environmental issues focusing on waste furniture, but not general problems such as global warming, pollution, emissions, or climate change, as the purpose of this research is to find out how waste furniture is dealt with in the UK. The author limits the area for investigation to the UK, because, as this study is about environmentally friendly approaches to design practice, the research needs to be carried out as sustainably as possible by conducting it within the author's current area of residence, which assists in maintaining in-depth investigations.

To collect data for the research, the study is conducted on the public's perceptions, mainly via exhibitions due to extensive access to design entrepreneurs and consumers through many design events within the UK from 2011 to 2013. Therefore, the results are very focused on the UK. To generate results internationally, there would have to be further study in various countries and with more participants at different scales of businesses. As the number of potential designers for this quantitative data collection in the UK is quite low, it has been supplemented with small design groups in the UK who have business experience and who are interviewed as a qualitative data collection. As limited numbers of small design groups are found, the interviews with designers are not particularly focused on using waste furniture, but any type of waste.

As the research focuses on the environmental perspectives regarding waste furniture, there are limitations in the scope of the literature review. Despite this, several theses and journals study sustainable approaches to a product and most investigate waste management relating to Life Cycling Assessment (LCA)[10] in larger manufacturing businesses. A few theses apply environmental concerns to individual design practice. Thus, some of the theoretical writings based on design development has been assessed to view sustainable considerations, and design history books and related craft publications have been appraised for design practice.

[10] Life-cycle assessment (LCA): a systematic method for assessing the environmental impacts associated with a product or service system to: a) build an inventory of inputs and outputs; b) make a qualitative and quantitative evaluation of those inputs and outputs; and c) to identify the most significant aspects of the system relative to the objectives of the study [ISO 14000].

1.4 Research aim and objectives

As a designer, the intriguing question is whether designers are doing enough to protect our environment and how much individuals could include this element in their practice. Thus, the author intends to investigate whether there are more sustainable approaches for contemporary furniture and product design for small businesses than the current production and consumption models, not just recycled or bio-degradable materials to emphasise how environmentally friendly the goods are.

This research has been driven to identify and tackle the problem of ongoing environmentally concerned design to guide consumers and designers alike. The aim of this research is to find the reason for an absence of products that are made from repurposed waste materials in small businesses and seek to produce an environmental business framework that can encourage more young designers towards this course of action. Also, the study aims to explore strategies to protect the environment by considering that designers can reducing existing landfill waste and transferring it into products with commercial value, which will encourage material reuse.

This study focuses on reutilising waste material in its original form, as reusage requires less energy than producing virgin materials and reduces landfill more effectively than recycling.

This study involves the following central research objectives:

- To understand the broader implications and importance of green issues and explore the key issues and systems of furniture waste management to investigate the current state and availability of waste and its relevance to waste re-use design;
- To investigate how young UK contemporary furniture design companies employ environmentally friendly manufacturing, to explore their business concept and problems and seek the appropriate strategies for design practices;
- To explore whether the trend for boosting environmental credentials has affected not only furniture and product design and production, but also furniture buying habits and public perceptions;
- To learn from design history within environmental views, evaluate them and capture the creative thinking and to inspire the ideas that support the practical design outcomes
- To experiment through design practice by adapting the findings from the research to develop a design process to find the reason for an absence of products that are made from repurposed waste materials and seek to encourage more artists to this course of action

1.5 Research Background

From the research, it is clear that waste is increasing and the EU insists that proper waste management is a key element in ensuring resource efficiency and sustainable growth (Waste statistics, Eurostat, 2016). Thus, this study investigates waste furniture to see what part designers can play in waste management and to see if any small groups of designers have applied this in practice. Furthermore, this thesis has gathered the public's perceptions on environmentally friendly design and products

from newly established design businesses. Also, by considering and exploring businesses running case studies, and issues that have arisen, it is hoped that common issues and approaches can be used to inform best practice.

1.5.1 The treatment of furniture waste and need for further solutions

Millions of items of furniture are continuously produced each day adding to an already saturated global marketplace. As per the 'Guidance on Applying the Waste Hierarchy' from the Department for Environment Food and Rural Affairs (DEFRA), furniture is placed under the category of households, but furniture waste is referred to as wood waste as most furniture is made from timber. Generally, furniture waste is treated in the same way as other wood waste, which is usually recycled into a variety of end products, such as panel board, mulch, or animal bedding. It is used as an energy source before it ends up in landfill but it is not handled using comparable methods. This case of recycling and energy recovery processing is only possible when the wood waste is clean; some wood is treated with chemicals. Furniture is probably not suitable waste, in this respect, as it often has a chemical application to ensure it is functional. However, furniture could be in better condition for the environment if it was saved before this stage of recycling and energy recovery.

Compared to a number of other comparable sustainable products and production processes, such as those associated with car and electrical appliance production, the furniture industry has not committed the same amount of time and resources to efficient waste recycling. For example, scrapped vehicles have a specific process of recycling following the regulation called End-of-Life Vehicles (ELV).[11] These comparable products have well-thought-out and specific organised recycling practices in place compared to the furniture production industry, which has never developed its own method of waste management, preferring to use existing timber waste processes that are often not appropriate. There can never be a perfect and final solution to environmental issues, but designers can make vast improvements, which is why it is necessary to continue to investigate methods for the progress of sustainable design.

1.5.2 Designing in an environmentally friendly manner

Some significant changes happened in 1960s Britain, when new technology developments such as labour-saving electrical appliances were possessed by most householders; all houses had electricity; global travel became popular; pre-packaged foods and frozen foods became more common; and multi-purpose furniture was the style of this plastic-using era. Many products were made available through the possibilities of mass production and, responding to the excesses of the 1960s, manufacturers and businesses continued to produce shiny, new, disposable, and convenient things, which made life easier for humans, but not for nature. Only humankind transforms the Earth to suit its needs and wants, compared to the needs of all other animals (alloplastically).

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[11] After a collection without the escape of hazardous materials and the End-of-Life Vehicles (ELV) details are recorded before it goes to dismantler to remove parts that can be sold for reuse, removal. After the depollution, the rest of the vehicle pieces go to the shredder that removes ferrous metals by magnetic separation and non-ferrous metals are sorted both mechanically and by hand. These materials break down mainly as plastics, rubber, glass, dirt, carpet fibres and seat foam. (ELV: guidance for waste sites, GOV.UK, 2017)

Traditionally, objects for living were made because they were needed. Today, the myriad of objects in daily use are mass-produced to a utilitarian and aesthetic standard, often completely unrelated, and, arguably, unnecessary for consumers' needs. With more production occurring, the smallest decision in design planning can have far-reaching consequences. This job of form-giving and reshaping has become the designer's responsibility.

Sustainable issues have affected designers in numerous ways and this is evident in much of their design. Yet, is this just another design trend in the 21st century? Many blogs, websites, and publications focus on and discuss product designs that have been influenced by green issues. These products are often referred to as environmentally friendly designs, eco-efficient, bio designs, eco-designs, sustainable designs, green designs, zero-waste designs, upcycled designs, cradle-to-cradle, and redesigns, which has become confusing to designers and the public alike.

This way of responsible design thinking seems to be the 'in thing' that every designer has to heed as a rule. However, the current trend of taking on environmental concerns in design ought not be treated as a fleeting fashion; designers are accountable for their work. In an ideal world, each product would be designed and produced in respect of environmental issues, would not cause unnecessary pollution, and would, ultimately, aid the planet and not destroy it. Furniture companies have specific regulations and policies enforced to reduce the negative environmental impact. On the other hand, individual designers and makers can use their work to encourage more ethical and responsible buying practices. Designers have the power to influence positive change because:

- they have the opportunity to design things to provoke changes in behaviour;
- they can make material choices that are sustainable;
- they can eliminate or reduce excessive and expensively produced fittings;
- they have the chance to design managing time and material to reduce environmental impacts in the production process; and
- they have the creativity to make things still look attractive without exaggerated packaging and unnecessary transporting of goods.

There is a growing need to foster and encourage furniture and product design experiments by practitioners amongst today's environmental concerns, because serious environmental issues have been raised and publicised by their work. Public environmental awareness was discussed for the first time by Carson (1962) and the realisation that some real environmental consideration is required by designers when producing products was initially highlighted by Papanek (1971).

These days, several terms are used for designs related to environmental consideration: eco, green, sustainable, environmentally friendly, zero waste, cradle-to-cradle, upcycling, and others; they are no longer new items or words used only by designers, but are also now familiar to the general public, as environmental problems have been recognised for many years. Some familiar terms were defined by Dewberry (1996) and McDonough (2002), who explain such terms are addressed by different levels using the environmentally responsible approach of reducing the environmental impact of a design, in part, or throughout its entire life cycle. These environmentally responsible designs have been applied to many professional design practices. For example, the global companies Herman Miller, Nike, and Method are carrying out

cradle-to-cradle studies ‘to retool their thinking and their actions in service to an eco-effective vision’ (Braungart and MacDonough, 2008, p.166).
As in this example, research on environmentally responsible design has been associated with large enterprises, a focus on mass manufacturing processes, and its end life; the current state of product design considering environmental concern has not been intensely researched for individual or small group practitioners. At this juncture, it becomes crucial to identify factors that are critical for implementing environmentally considered design practices to encourage future designers as a business. Thus, this study has been conducted to find current environmental issues caused by past actions and determine required action. It focuses on the problems of furniture waste that we face and design approaches relating to the current environmental issues.
As this study is practically based, the thesis is divided in two parts: part 1 is concerned with a contextual review of related design practice and part 2 is focused on findings from the author’s own design practice in an environmentally friendly manner, using waste furniture to influence both consumers and designers alike.
Part 1:

- indicates findings of how the green issue has influenced the design sector and the key issues of current waste management to discover the most beneficial and adoptable stage of the waste hierarchy into practice; and
- explores designs that are viewed as environmentally friendly, but may not have been at the time of production, to learn diverse approaches to sustainable design development and the power to influence the public.
- analyses the data from the public and indicate the findings regarding the public’s perception of re-used waste material products and sees what can be adopted from it for own practice;

Part 2:

- investigates the problems of small young contemporary furniture design businesses to seek appropriate suggestions and solutions to apply and improve design practice; and
- demonstrates design practice experiments with waste furniture including the problems that occurred during the design process. It shows how design development decisions are made through seeking solutions that encourage more designers to adopt this course of action

1.6 Research methodology and frameworks

1.6.1 A practice-based research

As previously mentioned, the research related to environmental issues has often been conducted by research specialists, with a focus on waste management or Life Cycle Assessment (LCA), rather than by design practitioners. As a creative designer, it is difficult to be conscious of the improvised series of actions and tacit knowledge used when producing objects, but through reflection and distance, an understanding of how and why objects came about can be gained, and the success and failure of ideas can be analysed. Therefore, the methodology of this research is practice-based in order

to learn by carrying out a series of design developments through improvising products while reusing waste materials.

This research draws upon the concept of 'reflective practice', introduced by Schön (1983): 'the research can be more pro-active, involving practice researching through creative action' (pp.308–309).

> … when we reject the traditional view of professional knowledge, recognising that practitioners may become reflective researchers in situations of uncertainty, instability, uniqueness, and conflict, we have recast the relationship between research and practice. For on this perspective, research is an activity of practitioners. It is triggered by features of the practice situation, undertaken on the spot, and immediately linked to action ... the exchange between research and practice is immediate, and reflection-in-action is its own implementation.

Through the creative practice of using waste materials (action), research reflects the findings from problems that occur and applies them immediately to improve design decisions for better future outcomes. This creative action becomes an opportunity to incubate knowledge and contextualise practice through a range of processes to obtain new insights into the procedures of practice.

Thus, like most practice-based research, this study has adopted a multi-method approach. Seeking to develop a broadly informed understanding of sustainable approaches in furniture design 'in its entirety', and in furniture design for the environment 'in process', is key to this study. The research inquiry examines the experience of practice as it is evolved within an actual professional situation, using qualitative research methods in the form of a humanly implemented inquiry carried out in a natural setting (Erlandson, Harris, Skipper, and Allen, 1993; DePoy and Gitlin, 1994; Stake, 1995; Miller and Fredericks, 2002). Naturalistic inquiry takes its strength from separate realities that have been constructed by different individuals. These separate realities must be given status in the lives of those individuals, in the contexts in which they operate, and in the reports of the inquiry (Lincoln and Guba, 1989). Because practice of this study is full creative decision making as a natural response, initial designs are modified and refined many times over the course of the inquiry (Erlandson, 1993, p.39) and the naturalistic inquiry for this design practice can be defined under the category that Bunnell (1998) adapted for her research:

- Human instrument: decision making for design development from the author/designer's own experience;
- Emergent methodology: the waste furniture primarily being used to improvise; and
- Negotiated outcomes: questioning through the exhibition of young design students' works with waste materials, interviews of small design professional groups, and opinion analysis from consumers as a multi-method approach.

This study collects both qualitative[12] and quantitative[13] data at the same time and seeks to merge the data to form a robust interpretation through practice. This interpretation provides quantitative information about perception and determination on contemporary furniture design as well as qualitative information from individual participants (designers) and the context in which they comment on the research problem (Creswell, 2009).

To design this research methodology, the framework of Carole Gray (2004) is adopted to visualise and identify the quality of 'sustainable design in contemporary furniture' and an approach modelled along the lines of an analytical 'triangulation'[14] is the most appropriate way to structure the practical research as it uses two or more methods of gathering information on an issue.

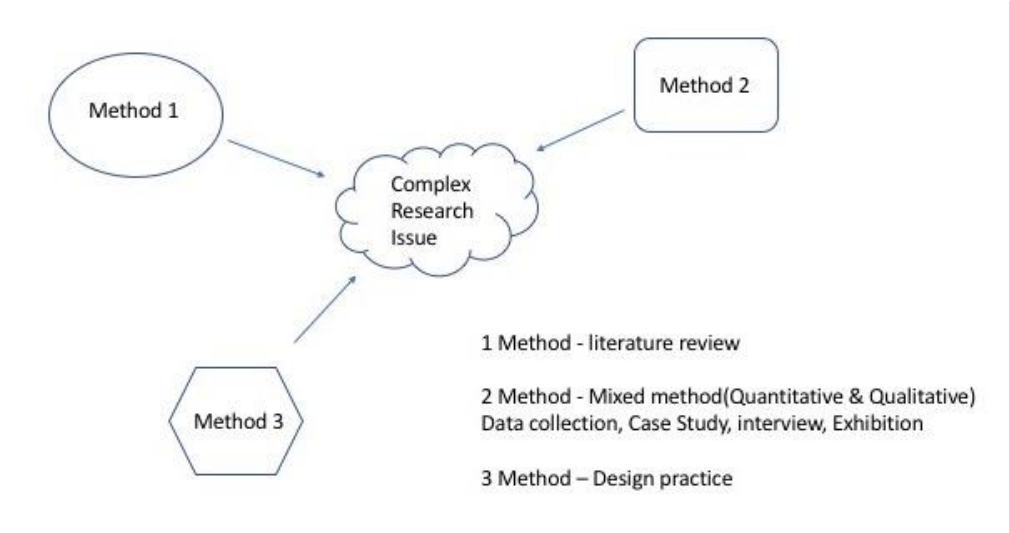

Figure 2 – Triangulation method diagram adopted by the author for this research

The two main topics of this thesis are: i) design, which is practical and material-based; and ii) environmentally conscious design, which is largely observational. Therefore, it makes sense to explore their relationship through design projects in real contexts.

As seen in Figure 2, the contextual analysis within the literature review uses method 1; the experiential qualitative research through case studies and exhibitions, and quantitative data collection of the survey use method 2; and professional practice reflected on during the application of methods 1 and 2 are used for method 3.

Thus, the conceptualisation of methodology and research design are explained within this framework. In this study, the concept of 'sustainable approaches to contemporary furniture design' within the framework is combined with design and workshop practice to generate a series of experiments, out of which is developed a series of new artefacts that challenge our understanding of sustainable furniture design. To achieve

[12] Qualitative research, on the other hand, is a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem (Creswell, 2009:4). The qualitative research investigates aspects of social life which are not amenable to quantitative measurement (Summer, 2006)

[13] Quantitative research is a means for testing objective theories by examining the relationship among variables (Creswell, 2009: 4) and it involves the collection of data in numerical form for quantitative analysis (Garwood, 2006).

[14] Gray, C., Malins, J., *Visualising Research*, Ashgate, Farnham, 2004, p.31 The use of two or more methods of gathering information on an issue is called 'triangulation'.

this, the method of data collection is important to obtain more detailed and rich information for sustainable approaches in furniture design and waste component re-appropriation.
This research rests upon a belief in inter-disciplinary practice and the following methods were employed in its development, to provide a historical understanding and a theoretical insight into a research methodology framed in terms of observation and experimentation:

- **Analysis of published sources:** including perceptions of the history of 20th-century sustainable design, in particular, waste component re-adoption via primary and secondary sources, visiting the V&A, The Geffrye Museum, the Imperial War Museum, the Design Museum, and reviewing key design texts such as The Green Imperative, Rethink, Utility Furniture, Recycle, and Eco-design;
- **Practical experimentation**: exploring responses to research through making and production. Reflection in and through action via sketchbooks, photographs, and mock-ups;
- **Dissemination:** the production, exhibition, and selling of pieces from Furniture Magpies for national and international exhibitions and design fairs demonstrates the viability of an environmentally responsible approach to design;
- **Data collection**: with peers, designers, and members of the public in exhibitions, or at interviews through surveys and questions, offers a system of critical design review, the results of which can be applied through practical design experiments; and
- **Data analysis:** from analysing the data collected, suggestions have been provided to help the running of small design businesses and design development guidelines that reflect the public's perception on sustainable design, while design practice has been carried out.

1.6.2 Methodology

1.6.2.1 Secondary research – literature review

The research question must be converted into alternate sustainable design processes that are made through experimental practice by reflecting on the responses to problems, including environmental issues and relationships with design in the past. To develop alternative environmentally friendly approaches to the design process, an examination and review of related literature is required.
To gain reliability and objectivity in the research outcomes, this study employs both primary and secondary research, as well as reflective practice, with the core aim of creating an alternate design process using waste materials with a sustainable approach for small design entities.
During the secondary research stage, this thesis initially collates theoretical backgrounds in furniture and product designs from the past, which can be seen as environmentally concerned designs in the present. Approaches are made through creative thinking and current environmental issues are focused upon in relation to furniture waste and waste management. This allows some useful insights and an in-depth understanding of the essential concepts prior to conducting the case studies

and practical project. In his book, Doing a Literature Review (1998), Hart emphasises the importance of a literature review by asserting that 'this might mean drawing elements from different theories to form a new synthesis or to provide a new insight. It might also mean re-examining an existing body of knowledge in light of a new development' (Hart, 1998, p.8). A series of contextual studies analysing design and environment issues are identified and critically examined.

The first stage of the literature review covers design practice in the past that meets recent sustainable design values, but differently in the history such as 'make-do-and-mend', 'Adhocism', 'Postmodernism', and 'recession'. These are explored as they demonstrate the adept reaction of their time period, which still reflects a sense of the current view of environmental approaches. The hierarchy of waste management is also examined to understand important aspects of the stage of designers' involvement required for subsequent environmentally responsible approaches. Therefore, exploring and examining design theories and waste issues in the literature review strengthens the theoretical background.

The literature review also discusses current sustainable design practice in trends and highlights its influence on the public. This is being done to develop a product that can tackle the issue while practical research is carried out.

Furthermore, regular reviews and up-to-date websites and blogs related to green design will be an important method as these two media are arguably the most reliable sources for an updated trend of sustainable issues in design.

1.6.2.2 Primary research

Data collection procedures in this research are derived from asking individuals about their practical experiences in their work in the form of case studies. Questionnaires are used as part of the quantitative and qualitative study and other practical methods are also used as qualitative data, such as exhibitions, interviews, and site visits. In depth, a focus group is employed as part of the qualitative study. Questionnaire strategies involve participants completing self-reporting instruments that measure their attitudes, beliefs, and so forth. The questionnaire design includes both closed-ended items (generating quantitative data) and open-ended items (generating qualitative data).

A. Qualitative and quantitative data collection

It is important to note that no research method is entirely quantitative or qualitative (Yin, 1994). This thesis employs a mixed-methods research approach, which collects both qualitative and quantitative data at the same time, referred to as parallel mixed methods (Teddlie and Tashakkori, 2009). Mixed-methods research is 'increasingly articulated, attached to the research practice, and recognised as the third major research approach or research paradigm' (Johnson, Onwuegbuzie and Turner, 2007). The method fuses philosophical thinking with design practice. Such methods collect qualitative data (data in the form of text, images, sounds) drawn from observations, interviews, and documentary evidence, and analyses it using qualitative data analysis methods. The most common quantitative methods are experiments, surveys, and historical data and the most common qualitative methods are case studies, action research, observations, and interviews. This thesis utilises a survey to assess people's perceptions of selected discarded materials to make products, but in an innovative way. The qualitative method is used for the focus group and one of the

case studies through the presentation of simple products and pieces of furniture in the first instance and collating data followed by questions (Figure 3).

Figure 3 – The first object of an exhibition alongside the other focus group's designs at Vitra London, a practical-based survey to encourage participants to become more readily involved (28.02.2012)

The actual survey questionnaires (see Appendix 1) for data collection have been developed through a focus group, Bucks New University MA Furniture Design course students; they exhibit their designs using waste to inspire people to 'buy less' (see Appendix 2). Semi-structured questionnaires include a combination of open-ended interview questions (with probes) that generate rich narrative data and closed-ended items that have predetermined response categories (e.g. demographic questions).
Both qualitative and quantitative methods are used for purposes of theory testing and refinement.

B. Case studies and a focus group

Through the case studies, this research can gather rich and in-depth information, and gain fundamental data from the existing design professionals' examples of practices. This study conducts practically driven primary research as case studies and a focus group. Dul and Hak (2007, p. 4) define a '*case study*': a case study is a study in which: a) one case (single case study) or a small number of cases (comparative case study) in their real-life context are selected; and b) scores obtained from these cases are analysed in a qualitative manner. The case studies have provided an insight for environmentally friendly design using waste materials in business by identifying the integral features of best practice and assist in the development of a framework.
The case studies in this thesis, obtained by interviewing prominent designers, helps to illuminate the debate on environmental issues pertaining to furniture and products in sustainable design, all of which gives a more informed understanding of the reality

of eco design, rather than the rhetoric and arguably the propaganda surrounding the subject. Subjects are interviewed individually, ideally in their own environment and asked to comment on real events, for example, an exhibition or running a business rather than giving generalisations that can reveal more about beliefs, attitudes, and behaviour. (see Appendix 3)

> This study also includes site visits as practically driven primary research to designers' studios and design shows that provide this thesis with the opportunity to research current sustainable approaches in furniture design. The focus group is used as a qualitative technique with open-ended questions regarding current production-related waste material application as well as a survey for quantitative research. The group interview is essentially a data gathering technique ... that relies upon the systematic questioning of several individuals simultaneously in a formal or informal setting ... has ordinarily been associated with marketing research under the label of a focus group, where the purpose is to gather consumer opinion on product characteristics (Fontana and Fray, 2000, p.70)

The focus group's observation requests the audiences' participation through exhibitions by answering and expressing their opinions freely and it makes the research method more interactive and positive regarding obtaining findings. In this regard, this research is devised within focus groups to ascertain the public's preference for the environmentally friendly design and the psychological cost of consumption about reusing and recycling used objects.

C. Practical experimentation

According to research from Professor Carole Gray and Julian Malins (2004, p.102), there is an absence of established and validated sets of research methods in Art and Design. They state that, 'Practice raises questions that can be investigated through research, which in turn impacts on practice' (p.18). In this regard, an investigation of the author's own experimental practice (methods) as a designer is an essential aspect of the study to acquire new knowledge and build a strategy for influencing people in creative, visual, three-dimensional, and other sensory ways that provide a compelling opportunity for original research.

As previously mentioned, questions are raised in practice and responded to through the practice of Furniture Magpies; the methodology of this study is driven by the prerequisite of design practice and creative progression. The Furniture Magpies business has provided a primary case study, giving the research its most central focus practically, theoretically, and commercially. Practical experiments are conducted within the company at the start of this research and developed by adapting findings from the study. The research journey provides a variety and depth that makes use of accepted research methods such as:

- Experimental object making;
- Observation and reflection on own practice; and
- Visual documentation of making processes.

Through reflection, the research journey and outcomes associated with products originally made by Furniture Magpies and a few other objects developed during the journey are introduced as results of this research. Outcomes of practical experiments still obtain the appropriation of furniture waste components, which have been subsequently adjusted by the data obtained via this mixed-methods approach.

D. Dissemination

Because this thesis investigates sustainable approaches in contemporary furniture design, gaining the most current information is pivotal for the study. So, conferences and workshops nationally, and internationally, have enabled the work to be subject to comment for critical appraisal and to position itself in such a way that it can contribute to knowledge across the broad field of design and production.
Visiting and presenting at the Milan Furniture Fair, alongside the London Design Festival as a trader, has provided comparative data about more trends regarding sustainability and advised the idea of the evaluation of the final solution. Exhibiting, interacting, gauging reactions, and meeting people from different environments and cultures is the fastest and most beneficial method of gathering information and getting feedback.

1.6.3 Research frameworks and methodology

Aims			Methodology	Chapter		Triangulation
OBJECTIVE	To understand the broader implications and importance of green issues and explore the key issues and systems of furniture waste management	To investigate the current state and availability of waste and its relevance to waste re-use design	Literature review, site visit	2	Recognition of green issues and management of furniture waste from a designer's perspective	Method 1 Method 2
OBJECTIVE	To learn from design history within environmental views, evaluate them, and capture the creative thinking	To inspire the ideas that support practical design outcomes	Literature review	3	Past designs demonstrating unintended sustainable thinking and contemporary sustainable design	Method 1
OBJECTIVE	To explore whether the trend for boosting environmental credentials has affected not only furniture and product design and production, but also furniture-buying habits and public perceptions	To capture the public's opinions that support practical results	Survey Exhibition Focus Group	4	Public perception of products made from waste materials	Method 2
OBJECTIVE	To investigate how young UK contemporary furniture design companies employ environmentally friendly manufacturing,	To realistically explore their business concept and problems, and seek the appropriate strategies for design practices	Interviews Case Study	5	Chapter 2. Waste material applications in small design businesses (case studies)	Method 2
OBJECTIVE	To experiment through design practice by adapting the findings from the research to develop a design process	To find the reason for the absence of products that are made from repurposed waste materials and seek to encourage more artists to this course of action	Reflective practice Site visits	6	Design practice and application of research findings	Method 3

Table 1 – Research framework

1.7 Literature review

Design for the Real World by Papanek (1972) is one of the first books to highlight some real environmental concerns about manufacturing products. He outlines his belief that designers are wasting their skills doing imprudent jobs instead of creating genuine work required to make the world a better place. He also emphasises in his other book, *The Green Imperative*, that the designer (planner) shares responsibility for nearly all of our products and tools, and, hence, nearly all of our environmental mistakes, and designers must bring social and moral judgement to be on the side of good (Papanek, 1985, pp. 55–56). For any kinds of production, there is no doubt that design is one of many processes, and as with many other products, furniture is also begun, developed, and made from a designer's ideas. Design is the starting point of all processes. Without design, no production can happen in the first place. Design is important for the entire process of making things and it is at the design stage that designers can most usefully implement their sustainable ideas. Designers have to take further responsibility because of the role they play in the industry's connection with the marketplace, interacting between people and products (Bhamra and Lofthouse, 2007, p.37). Understanding designers' responsibilities and the powerfulness of design for the future is the core approach of this study.

Papanek (1971) believed that, fundamentally, designers' work entices people to increase consumption. Other designers also suggest alternatives for unsustainable development at that time, such as Bonsiepe (1973) and Schumacher (1973), and now resonate into the 21st century; the design sector has been influenced by that. Academic research and literature on green product innovation have grown in interest (Brezet and Van Hemel, 1997; Strasser, 1999; Pujari et al., 2003; Chung and Tsai, 2007) and numerous journals demonstrate aspects within the furniture and product sector through scientific or technological methods, such as the Life-cycle assessment (LCA)[15] (Jungmeier, Werner, and Jarnehammar, 2002; Zbiciński, 2006; Gamage and Boyle, 2008), which is discussed again in Chapter 2 in relation to waste management. Most journals and books, including those above, show how the assessment is used to aid waste minimisation and pollution prevention from an environmental point of view. They describe what can be the potential impact on specific production methods or for finding more efficient forms of production and ways the methodology can be improved to produce a more desirable result.

Some literature and research were found relating to design and sustainability that have elements of what this study endeavours to consider. Dewberry (1996); Bhamra and Lofthouse (2007); McDonough and Braungart (2009) investigate sustainable design definitions, its need and its implementation in the design industry.

Dewberry (1996) defines environmentally responsible design as Eco design, Green design and sustainable design in her thesis, Eco Design, and explicates the divergence between them. What is summarised as 'green design' focuses on one or two environmental impacts of a product; 'eco design' refers to a comprehensive product life-cycle design strategy; and 'sustainable design' describes a move beyond the current context of design and investigates sustainable issues. Her thesis was

[15] A systematic method for assessing the environmental impacts associated with a product or service system to: a) build an inventory of inputs and outputs; b) make a qualitative and quantitative evaluation of those inputs and outputs; c) to identify the most significant aspects of the system relative to the objectives of the study [ISO 14000].

written in 1996 when there were not so many diverse expressions for Design for t Environment.
McDonough and Braungart (2002) in their book *Cradle to Cradle: Remaking the Way We Make Things*, set the concept of cradle-to-cradle (C2C) that has become a manifesto to many in production nowadays, and write that less is not necessarily good. Less does not translate into harmless; in the end it is just as damaging to the planet – it just takes a bit longer.
Plainly put, eco-efficiency only works to make the old, destructive system a bit less so. In some cases, it can be more pernicious, because its workings are more subtle and long term (Braungart and Mcdonough, 2009, p.52). Thus, the concept of C2C design encapsulates a journey of discovery about materials as biological or technical nutrients and their use and evolution during different periods. They created a framework for quality assessment and innovation: the C2C certified programme (c2ccertified.org, 2012). The programme has a comprehensive set of questions about every product:

- Do you know what is in your product, down to the molecule?
- Is your product designed to be safely recovered and reused, or be returned to nature?
- Are you using renewable energy?
- How clean is the water coming out of the factory?
- Is the product made in a socially fair way?

Additional to the literature above, Design for sustainability: a practical approach (Bhamra and Lofthouse 2007) is discussed from a practitioner's perspective and explains how design can help to control human impact on the environment. It also assesses sustainable methods, tools and techniques available to designers within a commercial context and introduces a new focus for design. They mention 'the decisions that designers make also have the opportunity to influence the way that consumers behave' (Bhamra and Lofthouse 2007, p.38).
Although all this literature supports the understanding of the entire design approach and the system of environmentally concerned products, and provides deeper thought for design development, there are omissions regarding individual design practice approaches and deliberations on a broad range of implementations for the entire system.
Thus, practical design-based approaches were further reviewed to see examples of practice in related to crafts. *100 chairs in 100 days* by Martino Gamper (2007) is a great example of the reuse of discarded materials; the project is based around chairs made out of reclaimed materials, such as dumped or unused street furniture. Gamper produced entire new chairs by combining the elements of existing ones. Gamper's first 29 out of the 100 chairs, in his initial collection, was displayed at the London Design Museum in 2007. Resulting from a visit to the exhibition, the author thought the chair combination was quite a mixture; some were quite impressive and clever like an art piece, but others were quite ugly on first impression. However, the idea of discarded chairs that create an interesting combination and working functionally, has changed the author's thoughts regarding waste materials. The approach of Gamper's design is elastic, highlighting the importance of contextual origin and enabling the creative potential of random individual elements spontaneously thrown together. The

process of personal action that leads towards creating, rather than hesitating. Like other design practices in the past, Gamper's design motivation is not a completely environmentally concerned approach, but it effectively demonstrates the potential of waste.

Two other craftspeople who consider reusing waste material in their artwork are the ceramists Slotte (2011) and Rylander (2012). Slotte (2011) applies her practice as a material-based and concept-based approach, a practice that originates in the material, both as matter and an idea. Thus, the materials play a key role in denoting an activity for the physical and conceptual in her practice. To express this, Slotte utilises second-hand objects in her pieces of art to express the link between memories and objects in human experience as the material imbues the work with historical, cultural, and economic implications.

Rylander (2012) uses only old, used, pre-existing porcelain and materials to embark on a ceramic practice to draw attention to what we otherwise tend to overlook: the modest and anonymous objects that surrounded us in our everyday life. Rylander's work is approaching to do with attitudes to work and to human existence through a method of working such as a joinery technique and materials. Rylander uses a highly pragmatic approach in a carefully planned and extremely precise manner to create a new piece that is no longer intended for everyday use.

These practical approaches are not particularly targeted to furniture, so may not offer discipline specific discourse regarding the subject furniture, but has insights into sustainability and reuse, value, and the environment, which are valid for individual design practice. Although these artists demonstrate the practical implementation of practitioners' personal views of its material use, this is not considered as time consuming and concentrates on the practicality of the use envisaged for the product.

Not many other theses have been found in the furniture design sector that have specifically applied environmental concern into the actual product. However, two environmentally concerned approaches to furniture and product design were discovered, which are in the exact design sector that the author is seeking. One is evident in the work of Cattle (2002) and the other in that of Seyajeh (2016).

The research by Seyajeh (2016) aims to set a framework for furniture design which mainly uses technology and is not practice-based or focused on materials used The SDI framework is designed to be an easily understood method and applied to the furniture design process as an aid for the decision-making stage. The tool and the application for this research are adapted from the design method, namely modularity and re-configurability, design structure matrix and axiomatic design, computer aided design (CAD), and the analytical hierarchy process (AHP), which has been successfully applied in part of this research to understand the application.

Grown Furniture (Cattle, 2002) is the most relevant piece to what this thesis endeavours to achieve in practical research terms, as it not only discusses the environmental issues on furniture in particular, but has developed design aspects with a defined technical outcome. Cattle's thesis deals with the proposal that environmentally benign items of free-standing furniture may be produced by the use of well-established techniques, such as training and grafting natural tree growth into shapes. The author suggests and designs a jig that people can follow to grow their own furniture. The project has been driven by the growing environmental concerns and humankind's awareness of environmental issues in the late 20th century and its continued and amplified influence in the 21st century. Although this thesis, assisting

people's involvement, offers instruction for reducing the environmental impact in a unique and pioneering way of producing furniture, it is never going to appeal to the masses as the process of physically growing a piece of furniture takes years and requires a level of commitment, not to mention facilities, which sadly are not viable or available for the everyday household. Even Cattle's most simple design, a stool, will normally take six years to grow. Even though the idea of growing your own furniture is truly environmentally friendly, it too has failings. In the guide, after completing the growing of the stool's frame, Cattle attached a seat made from MDF, a potentially damaging material in terms of the environment.
The disadvantages of this design outcome are that:

- This method has still not solved the problem we face, which is the waste generated by furniture that already exists; and
- If people were to follow the guidance of Chris Cattle, it would most certainly have a very positive impact on the environment. However, the author believes that this method could alienate people from sustainable design as it is time-demanding and requires commitment and patience.

While much literature exists about general sustainable design, and most consider manufacturer production in the furniture sector, unfortunately, very few practitioners are cited on the topic of reusing waste. Thus, an approach regarding the practice of using waste materials, and some artists' construction developments, are reviewed.
Reviewing the literature leads back to the research objectives: to determine the needs of products that are made from waste materials in furniture design is essential to furthering furniture waste reuse in practice. This may create an alternative practical approach to the idea of practitioners encouraging more young designers to follow this course of action to protect the environment as part of a designer's responsibility. To see the way of creative thinking through practice, some literature regarding the design process, craft, and making, Thinking Through Craft (Adamson, 2007), The shape of green (Hosey, 2012), The Craftsman (Sennet, 2009), and An Introduction to Sustainability and Aesthetics (Crouch, 2015) have influenced the definition of the making process for this practice-led study. This will be explained more in Part 2, Chapter 6 along with the practical development that is supported by the articles.

1.8 Outline of the structure of the thesis

This thesis is divided into two stages, the first being a contextual and theoretical exploration (literature review), which includes observations of sustainable design in a historical context and furniture waste management, the second being the data collection and analysis for the findings, and its evaluation through practical-based applications.
This thesis begins with a close look at the design application with the environmental issue we are facing. Chapter 2 (Recognition of green issues and management of furniture waste from a designer's perspective) illustrates how the recognition of green issues affects design and examines 'furniture waste', its relationship to design practice, and the benefits it offers to define the most 'desirable' environmentally friendly design model.
Then, the thesis moves on to a contextual and theoretical exploration of previous designs that have an environmentally friendly perspective in the past and present.

Chapter 3 (Past designs demonstrating unintended sustainable thinking and contemporary sustainable design) explores a series of sustainable products throughout history that have current sustainable value, and current environmentally concerned designs are examined to see if any furniture waste material has been used for previous designs. Exploring examples in the past and present from various backgrounds support learning through creative thinking and its approaches to evaluation, and develops them into practical experiments. In Chapter 4 (Public perception of products made from waste materials), an exploration of current environmentally concerned designs has been undertaken to understand the importance of designers' role in showing how designers can influence the public through their work.

Since this thesis analyses an example of a small group of designers regarding the use of waste materials in a business context, a more practical-related investigation is illustrated in Part 2. Chapter 5 (Waste material application in small design business) involves carrying out field research to study the current state of the business, as well as exploring the notion of design practice. A series of case studies on the environmental aspects of design practice will be critically analysed. This thesis then moves on to a practical exploration based on designing and making in Chapter 6 (Design practice and application of research findings) to explore the approaches and personal rationale, decision making, and reasoning for design decisions. It shows how an actual series of design developments are employed in the production of an experiment in product design processes using furniture waste materials in practice.

Chapter 7 (Conclusion) attempts to synthesise all findings from individual chapters to set up an environmentally friendly design and suggest alternative sustainable design approaches for businesses, which can encourage and inform young designers and future design businesses with waste material reuse.

PART 1: Contextual review related to design practice

Chapter 2. Recognition of green issues and management of furniture waste from a designer's perspective

2.1 Introduction

The global issues of sustainability have been increasingly scrutinised since the 19th century. These days, due in part to continued public discussion in the media, most people are aware of the detrimental effect that continued industrial progress has had on the planet. Of course, designers are a part of this group, and a part of the problem as well as the solution. This chapter illustrates the growth of green issue recognition and how it is currently raised in the public's consciousness. To understand the actual problem that lies behind active campaigns against waste, it is necessary to reconsider decisions being made at the stage of design practice. The management of furniture waste needs to be implemented in such a way that it is possible to determine the most beneficial stage at which to adopt solutions to the current waste products hierarchy: the 3 Rs (Reduce, Reuse and Recycle). These have been widely introduced in the UK, but require a link between theory and practice, to find a way to apply the practical study effectively.

2.2 Awakening of green issues and current environmental issues

How long ago did the awareness of environmental issues start? Most of us think that environmental awareness has only developed over the past 30 or 40 years. However, Meister Eckhart, a German theologian, raised the issue of our environmental difficulties much earlier. Eckhart was aware of the sensitive nature of the Earth's response to human influences in the 13th century (Woods, 2011). English demographer and political economist Thomas Malthus also demonstrated an understanding of environmental issues during the 18th century. In his essay called 'An Essay on the Principle of Population Malthus' (1798), he argued that there needed to be a balance struck between population growth and the ability to sustain that population if life on Earth was to remain tolerable. Although the book pointed out population growth, with the Industrial Revolution, worldwide human population had grown to double the number[16] by altering medicine and living standards. Coal-mining, a key factor in the Industrial Revolution, made the manufacture of low-value/high-volume goods possible (Arrighi, 1994); it brought more efficiency in production, but it also triggered air and water pollution from coal burning, which caused a mass migration from rural areas to the city for factory work.

> 'And what cities! … smoke hung over them and filth impregnated them, the elementary public services – water

[16] The world's human population growth rate hovered around .1 percent (.001) per year for seven to eight centuries after 1 C.E. At the dawn of the Industrial Revolution in the mid-1700s, this population had grown by about 57 percent to 700 million. It would reach one billion in 1800. (UNPD)

> supply, sanitation, street-cleaning, open spaces, and so on – could not keep pace with the mass migration of men into the cities, thus producing, especially after 1830, epidemics of cholera, typhoid and an appalling constant toll of the two great groups of nineteenth century urban killers – air pollution and water pollution or respiratory and intestinal disease' (Hobsbawm, 1969, p. 86).

The issue of environmental damage was raised centuries later in the book *Silent Spring* (Carson, 1962). Carson calls for humans to act responsibly, carefully, and as stewards of the living Earth. The book demonstrates the destructive impact of pesticides on the environment, particularly DDT,[17] by explaining how it is damaging to human health; people began to notice the detrimental effects it was having. The sentiments of the book were widely accepted by the public, which could be the reason that people tend to think that sustainable awareness has only evolved over the last 50 years.

From this period came, what we could call, the launch of the environmental movement from which today's public awareness has grown. Over the last 50 years, many more regulations, terms, protocols, and agreements have been generated to try to solve sustainable issues that are causing irreparable damage to the Earth. During this period, more and more people have become conscious of the many global issues we have to confront. In 1968, experts from around the world met for the first time at the UN Biosphere Conference in Paris, France, to discuss global environmental problems. These focused on pollution, a loss of resources, and the destruction of wetlands. This was the beginning of co-operative governance for environmental issues around the world, building the foundation for many more conferences that followed. In 1987, the *Brundtland Report* 'Our Common Future' was published defining 'sustainable development' as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs (UN, 1987)' and has popularised the term sustainable development as it is generally understood today. In 1989, the report was debated in the UN General Assembly, which decided to organise a UN conferences on Environment and Development and the definition was then adopted at the summit on environment in Rio di Janeiro 1992. During these subsequent conferences, more advanced protocols, agendas and conventions were set, such as The Basel Convention,[18] Agenda 21,[19] and the Kyoto Protocol.[20] Although these international agreements may be unfamiliar, this thesis will not discuss

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[17] DDT (dichlorodiphenyltrichloroethane) was developed in 1939 and used in World War II to control malaria and typhus among US troop, it enters the food chain and accumulates in the fatty tissues of animals, with damaging effects on human health as a consequence.

[18] The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted on 22 March 1989 by the Conference of Plenipotentiaries in Basel, Switzerland, in response to a public outcry following the discovery in the 1980s in Africa and other parts of the developing world of deposits of toxic wastes imported from abroad (www.basel.int).

[19] Agenda 21 is a global action plan for sustainable development into the 21st century. Sustainable development is a process that aims to meets the needs of the present generation without harming the ability of future generations to meet their needs (Agenda 21: Programme of Action for Sustainable Development, Volume 3 Number 2 - June 1999).

[20] The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change, which commits its Parties by setting internationally binding emission reduction targets (www.unfccc.int).

each of them in detail as they are out of the scope of this study; for more information, please see the footnotes. All of these international arrangements are raised to solve environmental problems of the Earth and to formulate the commitment of individual governments. Regarding issues of environmental concern, the words of celebrities such as Al Gore can be hugely influential, can provide a positive effect, and spark people's interest and awareness in the subject. In *Earth In The Balance* (Gore, 1992) he stresses how important it is to know about the environmental problems we face and it has become a familiar acknowledgement of environmentalism to the public.

> I have come to believe that we must take bold and unequivocal action: we must make the rescue of the environment the central organising principle for civilisation. Whether we realise it or not, we are now engaged in an epic battle to right the balance of our Earth … (Gore, 1992, p.269)

Gore (1992) explains that we are confronted by a worldwide crisis: the destruction of the earth's fragile balance and the loss of its ecological Stability. With these kinds of internationally united efforts and statements from familiar people, the public are now more aware than ever about green issues. There is even a new terminology 'The Anthropocene' (the age of the human) that was popularised by atmospheric chemist Paul Crutzen in 2000. The word expresses the timeline of Earth histories, such as Pleistocene and Holocene. Compared to the history of the planet (4.6 billion years), human history covers less than 0.01% (200,000 years) which is a tiny geological epoch. However, we know that human actions have caused massive environmental implications during this time. With technological growth, we can now witness in real time the effects of our actions on our local surroundings and on the whole planet. This kind of technology proved many hypotheses that environmental problems are a real and present danger. A report from the National Aeronautics and Space Administration (NASA) alleged that if humankind was wiped out, the planet would prosper.

> 'Green' aliens might object to the environmental damage humans have caused on Earth and wipe us out to save the planet. 'These scenarios give us reason to limit our growth and reduce our impact on global ecosystems. It would be particularly important for us to limit our emissions of greenhouse gases, since atmospheric composition can be observed from other planets,' author states (Sample, 2011).

This statement from NASA neatly summarises what humans have done to the Earth. In comparison to scientifically proven judgements like this one from NASA, sometimes the use of images and graphics can be more effective in arousing people's awareness of green issues. The poster from a campaign by the World Wildlife Fund (WWF) (Figure 4) is a good example of how public awareness can be increased. The image along with the warning message 'Stop climate change before it changes you!' aims to activate our self-awakening on the issue as a species.

Figure 4 – The campaign of the World Wildlife Fund has the picture of a human who has the face of a fish, designed to help people think about what they could do in their daily lives to make an impact. From the Reduce Your Climate Impact site, coinciding with the UN Climate Talks in Bali, Indonesia, December 2007.

Keeping people informed that environmental issues are continuing from the past into the present is vital, although the means of disseminating the information has changed from publishing a book in the 1960s (Carson's Silent Spring, 1962) to a visual poster by the WWF (Figure 4). Thus, to increase the awareness of our impact on the Earth, the WWF has been evaluating and popularising a worldwide event, the Earth Hour, when by switching electric lighting off for an hour on a specific day towards the end of March, we aim to increase our awareness of the effects of climate change. This is now a symbolic global movement for people who protect and care about the environment, and is recognised as successfully promoting their aim of taking a stand against climate change. Since environmental sustainability has become too important to be neglected, many products seem to boost their ecological credentials as a popular promotion and marketing tool, which can be misleading and unreliable. For example, IKEA use sophisticated language and powerful advertising (Figure 5) to create an illusion of value, desirability, and environmental consciousness. It is contradictory to advertise the Earth Hour Day to remind users of the need to save energy, while continuing to manufacture products which have a short life expectancy. Although the products could ultimately be less damaging to the world, in fact, most of the products end their lives as landfill.

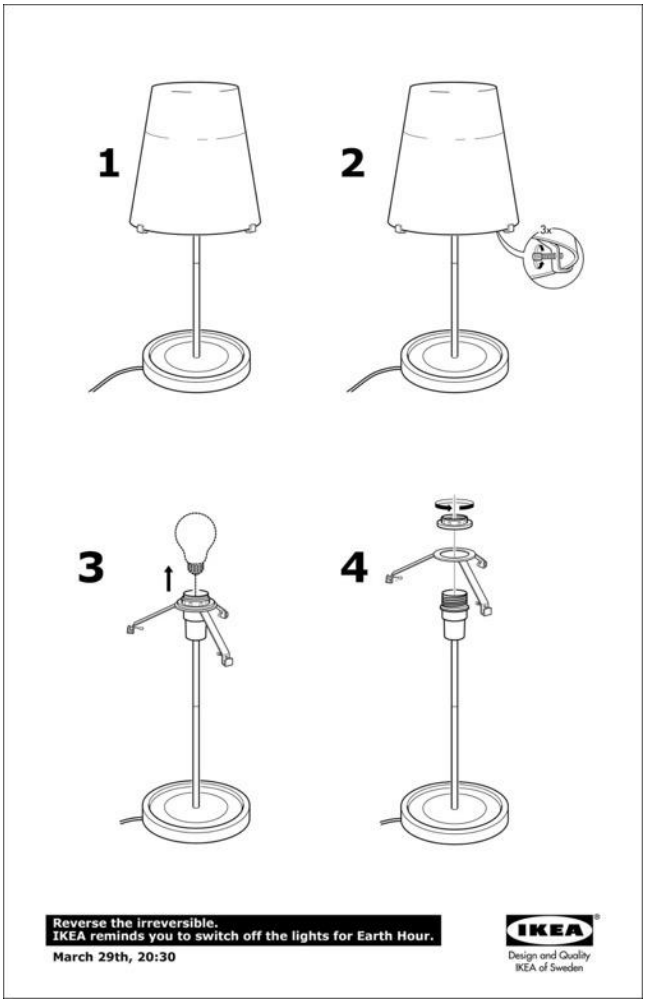

Figure 5 – IKEA reminds you to switch off the lights for Earth Hour © Ogilvy, 2014.

The problem is that saving energy or cutting carbon emissions, which is the main root of global warming, can feel negative and pessimistic. Earth Hour is an 'ineffective feel-good event' that sends the wrong message about electricity (Lomborg, 2014) and it might not have an effect on overall carbon emissions because we may have to use more carbon-intensive power sources to restore the supply afterwards (Hayman, 2010). Opposed to this criticism, the organisers stress that Earth Hour is not about saving energy or carbon reduction, but a positive inspiring event to raise awareness. Recognition and acknowledgement of green issues are expanding every year as a result of this type of movement, but it is not enough merely to identify the problems; solutions for them must also be considered. This aspect is treated as a priority in this study, as part of the practical experiment, because the author believes there is an alternative solution to green issues which does not create a negative impact on the planet.

2.3 The 3Rs: Reduce, Reuse, and Recycle

We are all aware of our duty to recycle our waste and take energy-saving measures in order to lessen our destructive impact on the environment and work to improve the current situation. It is impossible to achieve 100% waste prevention, however,

because every process produces waste. Industries across the board are working to lower the amount of physical waste. One campaign that rolled out worldwide is 'The 3Rs - Reduce, Reuse, and Recycle'. The idea of this campaign and message is to inspire and encourage people to live in a more environmentally conscious manner and to convert to a more ecological way of life. The universal recycling symbol for the sign is a Mobius loop comprising three changing arrows used to form a triangle (Figure 6); t is widely used and easily recognised these days. This symbol was originally designed by Gary Anderson in the late 1960s for a competition sponsored by a Chicago-based recycled paperboard company to raise environmental awareness. Because this symbol is not a trademark, and its use is not regulated, we often see that this has evolved in various ways. For example, this visual mark can be seen in the symbol used in The Royal Borough of Windsor and Maidenhead (Figure 7) who altered it for their own purpose, keeping just one arrow, which is more familiar in the UK. Simple graphical marks are easier to understand than text as they are instantly recognisable and the recycle symbol has represented our environmental awareness as well as a call to action.

Figure 6 – The triangle in the recycling sign represents the 'Reduce, Reuse, Recycle' in the Waste Hierarchy, the three main stages of waste management.

Figure 7 – The Royal Borough of Windsor and Maidenhead use this circular shaped arrow as their symbol to promote ecologically-sound waste removal, along with the words reuse, reduce, recycle. © The Royal Borough of Windsor and Maidenhead

Due to the familiarity of the campaign, it seems that we all now know the meaning of the '3Rs' without the need to consult a dictionary, but do we really? The Longman dictionary (Mayor, 2009) defines them as follows:

- Reduce: to **make** something **smaller or less** in size, amount, or price;
- Reuse: to **use** something **again**;
- Recycle: to **put** used objects or materials **through a special process** so that they can be used again.

These words might have similar meanings, but they are remarkably different; the words in bold show the stark differences between them. The terms reduce, reuse, and recycle are originally from the 3Rs of the Waste hierarchy (Figure 8) and were first introduced into the European waste policy by the European Union's Waste Framework Directive in 1975, for which prevention was the best option, followed by reuse, recycling, and other forms of recovery, with disposal such as landfill as the last resort.

Figure 8 – Waste hierarchy showing all of the stages of waste management and which stage is the most preferred for the environment © Leicestershire County Council.

The waste hierarchy prioritises the prevention and reduction of waste, promotes reuse and recycling and identifies the need for the optimisation of its final disposal. The waste hierarchy refers to waste-minimisation, which classifies strategies according to their desirability. The 3Rs are arranged in order of importance in the waste hierarchy principle. Here, each of the 3Rs is explained with practical examples.

Reduce: Tesco developed a product in 2009 in conjunction with WRAP (Waste & Resources Action Programme). Tesco's introduction of a double concentrate squash led to its traditional 3 litre concentrate bottles being replaced by 1.5 litre bottles. This generated a weight saving of 46%, reducing the need for handling and lowering plastic usage by 469 tonnes per year. Tesco also introduced the use of a 100% recyclable PET (Polyethylene terephthalate) for the bottles, achieving yet further savings (WRAP, 2009).

Reuse: In Cuba, many people simply cannot afford to treat objects as disposable. Household waste, which, in richer countries would be dumped, discarded, and sealed in landfill is reused and reincarnated in ingenious ways. Cups are made from salvaged soda cans and plastic containers; discarded aluminium sheets from an eating utensils factory is transformed into a fence; a taxi sign is made from a plastic bottle with a light inside for illumination. (Figure 9) Everything is valued for its inherent or material quality and is reused according to this rule (Siegle, 2006, p.110-117)

Recycle: An interesting but disturbing fact on the recycling of raw materials from desktop computers was discovered by the United Nations University in 2004. Manufacturing one desktop computer and a 17-inch CRT monitor uses at least 240kg of fossil fuels, 20kg of chemicals and 1500kg of water – a total of nearly two tons of material! All told, computers require at least 10 times their weight in fossil fuels and chemicals to be manufactured (Material Processing Corporation, 2008).

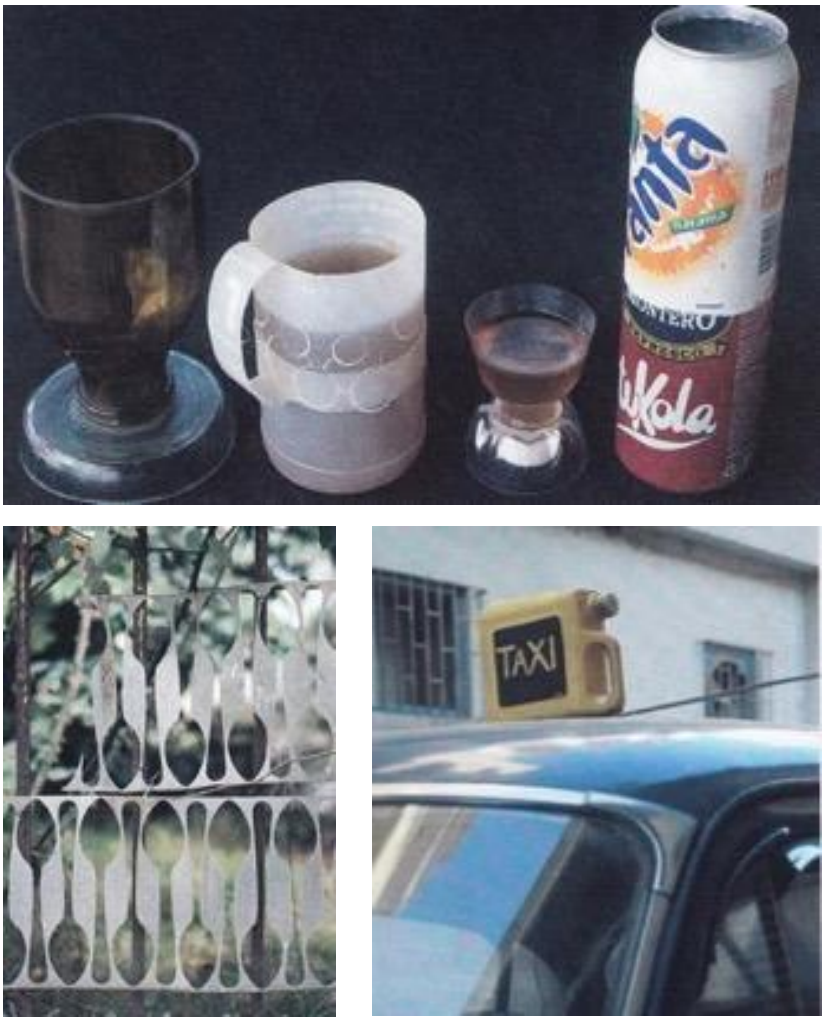

Figure 9 – Some reused waste examples in Cuba © Recycle, The essential guide, Black Dog, 2006.

The three examples illustrated in Figure 9 show how the 3Rs can be applied and the results, which can be either positive or negative to the environment. Consequently, decisions about waste management need to be precise, using an appropriate method from the 3Rs. For a more positive effect, the simultaneous use of the 3Rs can have

a more positive effect than using just one of the 3Rs individually. Public awareness of waste issues has increased thanks to the prevalence of the 3Rs terms. A brief environmental graffiti campaign, 'Think Green' (Figure 10) at Bucks New University used the symbol of the 3Rs for the Students' Union and Green Society Club to promote their green policies. Bucks New University was publicising its achievement of the Carbon Trust Standard in recognition of measuring, managing and reducing their carbon emissions. From a 2005/6 baseline of 6,975 tonnes of CO2 it reduced its carbon footprint to 4,970 tonnes – a reduction of over 2,000 tonnes per year, or 29% (Bucks New Uni, 2012). Arguably these figures alone are not easy to understand and do not demonstrate how the university is resolving **its** green problems, but the signage, imagery and well-known phrases work; they imprint on people's consciousness and help to raise awareness.

Figure 10 – Think Green graffiti using the slogan of 3Rs: Reduce, Reuse and Recycle, at Bucks New University, March 2012.

A well-known example of a successful imagery campaign is the food waste campaign 'Love Food Hate Waste' (Figure 11). This campaign aims to raise awareness of the need to reduce the amount of food that is thrown away and thus benefit the environment. The campaign was developed by WRAP in response to data on food waste. The production, processing, transportation and storage of food contribute to around 20% of climate change. Despite all the energy consumed in food manufacturing, a third of the food purchased is thrown away. If the waste of all of this good food could be stopped, its impact on the environment would be huge – the equivalent of taking one in four cars off UK roads, equal to at least 17 million tonnes of carbon dioxide equivalents per year. Even if the statistics involved here are not fully understood, the message is a reminder of what the issue is and, in a simple but effective way, makes us think about the consequences of our actions. If people are reminded often about these environmental effects, it may help to change public perceptions and eventually become common practice for everyone.

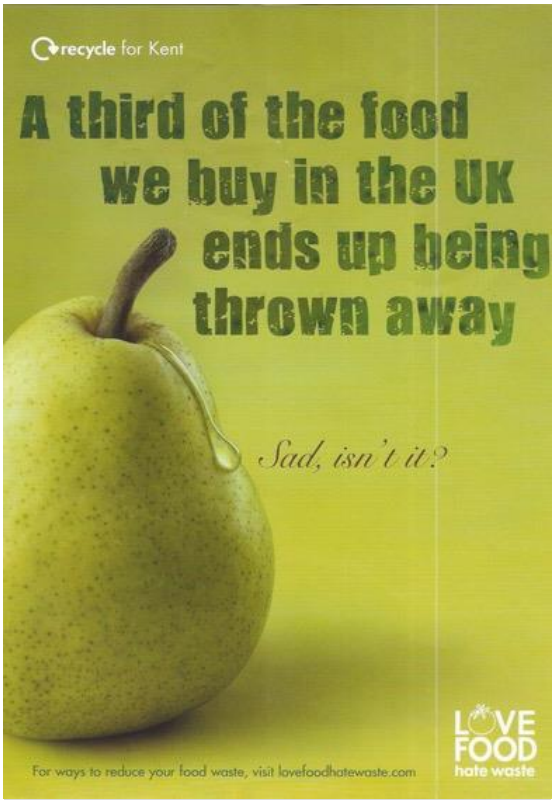

Figure 11 – The image of the 'Love Food Hate Waste' campaign, 2010 ©WRAP

2.4 Furniture Waste

The steps of 3Rs can also be applied to furniture waste. If furniture production processes could be minimised, this would be represented by the stage of Reduce. After the furniture has come to the end of its original purpose but is still usable, it could be sold for reuse or serve a second use. Once it no longer has any practical use, it can be chipped or reprocessed for recycling. If the furniture waste is not serviceable for even the recycling stage, it ends up as an energy source or goes to landfill as it is assessed under the other wood waste category.

According to the GPP's (European Commission Green Public Procurement) Training Toolkit Background Product Report,[21] the Swedish furniture industry's average furniture product consists of 70w%[22] wood (-based material), 15w% padding materials (mainly polyurethane and polyester foam), 10w% metals, and 5w% other materials (plastics, textiles, and glass etc). In general, the environmental impact of furniture stems mostly from the production and treatment of the raw materials used in its manufacture rather than the production of the furniture itself. Therefore, the focus of this study is on the environmental aspects of the main materials that are being used in furniture and their finishing treatments (such as lacquering, painting, or gluing).

Most furniture waste is distinct from other waste timber materials. The life span of furniture is not based on its ability to function, but more on the owner's views and tastes influenced by current trends. Furniture waste can embrace a greater value

[21] European Commission DG Environment-G2, B-1049, Bruxelles, *European Commission Green Public Procurement (GPP) Training Toolkit - Module 3: Purchasing Recommendations*, Barcelona, 2008

[22] w% is the share by weight of a certain material in a piece of furniture.

when reused instead of shredding it for fuel or dumping in landfill. Furniture waste needs an improved arrangement in its reuse category as a lot of effort and embodied energy has been invested in each designed component, much more so than the raw timber materials used for buildings in construction, for example.
The European Furniture Manufacturers Federation (UEA) [23] represents the consequences of furniture waste in Table 1, which shows the lifetime and replacement years of furniture in the EU. Every year, 45.4 million pieces of household furniture are thrown away. The replacement rate of furniture is 70% and huge quantities of furniture waste is generated. The quantity of waste in Table 1 shows only household furniture waste, and does not include office furniture waste. The quantity of furniture waste would be prodigious if it was to also include contract furniture. From the figures, it seems that 30% of furniture waste could be recycled, but, in fact, the UEA states that furniture waste in the EU accounts annually for more than 4% of the total municipal solid waste of which 80–90% is incinerated or dumped in landfills, whereas only 10% is recycled.

	Lifetime Years	**Replacement Years**	**Replacement Rate**	**1,000 Units to be disposed of**	**Average weight (kg)**	**Total weight (1,000kg)**
DINING ROOM						
Tables	12–15	15–20	70%	7,280	20–40	218,400
Cabinets	12–15	15–20	70%	11,480	100–140	1,377,600
BEDROOM						
Wooden wardrobes	12–20	15–20	70%	11,760	100–140	1,411,200
Chest of drawers	12–20	15–20	70%	5,040	50–70	302,400
Wooden beds	12–20	15–20	70%	3,136	40–60	156,800
Bedside tables	12–20	15–20	70%	1,680	10–20	33,600
Fitted Kitchen	20–25	25–20	70%	3,080	>200	1,232,000
Chairs	5–15	8–10	70%	2,100	1–5	147,000
				45,556		**3,639,000**

Table 2 – Estimated annual household furniture waste in the EU (Annual report, UEA, 2002).

Thankfully in the sequence of events furniture waste goes through before reaching landfill, there are some alternative routes that could be taken. Reuse can be promoted through re-selling by charity shops, car boot sales, antique and vintage shops and

[23] The European Furniture Manufacturers Federation (UEA) was established in 1950 to promote between furniture manufactures in post-war Europe. Today, the UEA supports furniture manufacturing in EU countries and exchanges information with all the European furniture federations https://www.ueanet.com/, 09.11.2018.

markets (Figure 12), online markets like eBay, Shpock and Facebook marketplace, all of which prompt people to purchase for reuse. However, this is only likely if the furniture adheres to the style and taste of the prospective buyers. In the event of it not selling, the furniture has to go to the next stage, which is recycling. Normally recycling wooden furniture consists of collection by wood chippers (Figure 13) to be used as animal bedding or turned into raw materials like particle, chipboard or MDF. In the Wood Waste Market Situation Report by WRAP, the graph of types of wood waste (Figure 14) shows that furniture waste is included in wood waste and, according to a 2009 survey from the British Woodworking Federation (BWF), the main use for wood waste highlighted by the BWF's members was animal bedding, use by employees for fuel and finally burnt to provide heat for the factory. The recycling stage explains that most pieces of furniture receive the same treatment as other wood waste.

Figure 12 – Brackley Antiques Cellar, shows second-hand furniture sold for reuse 01.10.2014. ©Self-taken

Figure 13 – Once the wood has been collected or tipped it is separated then put through a shredder. It is then screened to produce different grades of wood chips. The larger woodchips are mainly sent to chipboard factories, while the finer material is used for cattle bedding © South Wales Wood Recycling.

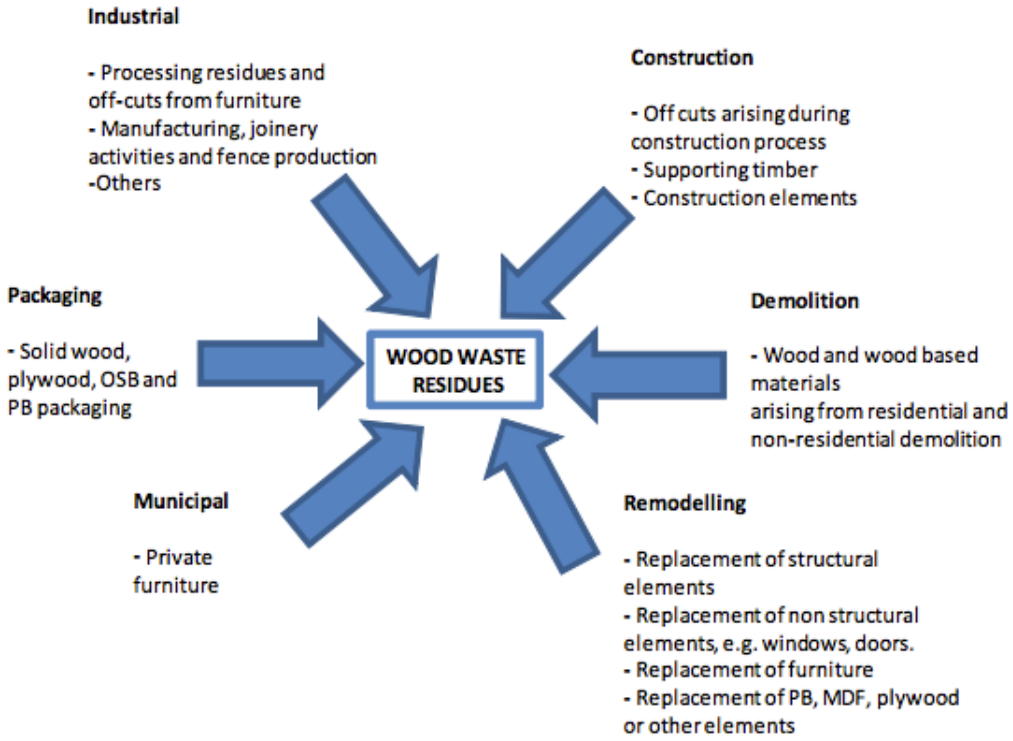

Figure 14 – Types of wood waste, Wood Waste Market in the UK, © WRAP (2009).

The furniture industry is encouraged to analyse its products using the LCA[24] method to provide a more positive impact on the planet. LCA is a popular assessment method for environmental judgement of industrial products. It is a well-established methodology evaluating a product's environmental performance from cradle to grave. The Society of Environmental Toxicology and Chemistry defines the life-cycle assessment process as follows:

[24] Life cycle assessment (LCA): A systematic method for assessing the environmental impacts associated with a product or service system to a) build an inventory of inputs and outputs; b) make a qualitative and quantitative evaluation of those inputs and outputs; c) to identify the most significant aspects of the system relative to the objectives of the study [ISO 14000].

> ‘Life-cycle assessment (LCA) evaluates environmental performance throughout the sequence of activities executed in creating a product or performing a service. Extraction and consumption of resources (including energy), as well as releases to air, water, and soil, are quantified through all stages along the life cycle of products and services. Their potential contribution to environmental impact categories is then assessed. These categories include climate change, human and eco-toxicity, ionizing radiation, and resource base deterioration e.g. water, non-renewable primary energy resources, land’ (UNEP, 2011)

The West Wind Hardwood, a retail company of fine quality wood and speciality plywood in Canada, illustrates LCA in an easily understood graphical diagram (Figure 15). LCA is the circulation of an entire cycle of production working with defined environmental policies. Nothing is to be disconnected in the cycle and any outcome of the cycle, including waste, can be returned to the planet positively.

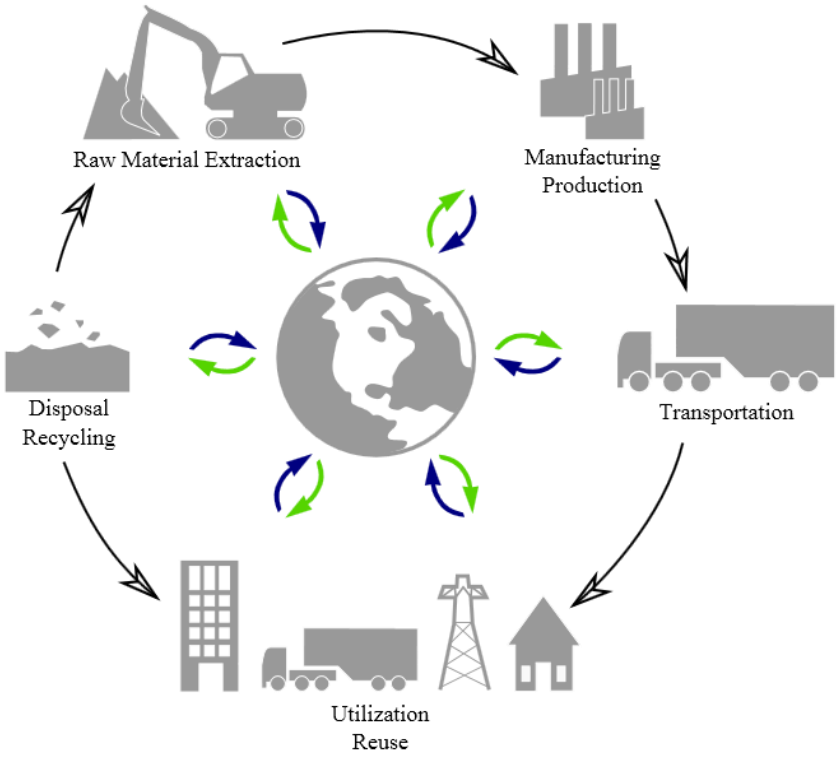

Figure 15 – A diagram of LCA, source © West Wind Hardwood company in Canada.

The energy to create the materials consumed in producing all products including furniture can be measured. This is called embodied energy (EE). As this energy is related to carbon footprints, it is often measured for LCA analyses to calculate the environmental impact. The wide range of materials and products used today are made by the initial extraction of raw materials, processing, manufacture, transport to site or marketplace, and construction as the finished building or final use as a product. The energy associated with all these steps and processes is what makes up the EE of the

furniture and its materials. From a material point of view, most pieces of furniture have lower levels of EE as they are constructed mainly from wood. This is only appropriate for comparing materials on a kilogram basis, so products must be compared on a functional unit basis (please see Table 2).

Materials	**Embodied Energy (MJ/kg)**
Timber (Inc. Veneered particle board)	7.40–23.00
Cement	4.60–10.90
Brick	3.00
Steel	24.40–56.70
Glass (Inc. Toughened)	15.00–28.00
Aluminium	154.00-218.00
Plastic (Inc. PVC, Nylon)	67.50–138.60
Rubber	67.60–120.00

Table 3 – Embodied energy (EE) for common materials for furniture per kg. The table about EE is made with reference to the Inventory of Carbon and Energy (ICE), Version 1.6a, from the University of Bath's EE and embodied carbon database.

From the table, we can see how the EE will be affected if a builder, architect, or designer used a cubic metre of brick or stone as opposed to a cubic metre of timber in a project. Although the EE of recycled materials from virgin materials has not been indicated in this table, referring to the full ICE table (see Appendix 4), indicates that most of the recycled materials show lower energy usage than virgin materials.

2.5 Summary of chapter

Warnings about green issues have been circulated to the public and designers for years by worldwide organisations and national governments with the intention of minimising the impact of waste on the planet. Despite these efforts, environmental problems remain due to previously created waste. At present, continual warnings are being coordinated, including Earth Hour action, but sometimes this type of campaign is not actually considered from an environmental viewpoint of the negative impact that such waste has on the planet. On the other hand, the '3Rs – Reduce, Reuse, and Recycle' are broadly accepted by the public, encouraging them to live in a more environmentally conscious manner and converting to a more ecological way of managing their lives.

The 3Rs have also been applied in the management of waste furniture; reduction and recycling are mainly considered in its production using a programme called LCA. There is no doubt that the production process followed by LCA is a precise method for the reduction and lessening of resources. Potential waste minimisation at the beginning of the process of LCA is being continuously investigated and developed for an improved result, yet the assessment cannot advise on the waste that has been generated during production, because LCA is not designed to enable zero waste.

Through LCA, EE can be measured; this is the energy consumed by all of the processes associated with the production. Furniture is mainly constructed from timber, which is low in EE; furniture waste also produces less EE when recycled than other

materials. This is why the design practice in this study has experimented with furniture waste with the aim of reusing materials, thus reducing the production process for lower energy-consumption.

As reduction and recycling are actively and widely applied in production, from the author's viewpoint as an individual designer and maker, this thesis focuses on investigating the niche sector 'Reuse', for which practitioners can adopt the approach of utilising used materials.

Chapter 3. Past designs demonstrating unintended sustainable thinking and contemporary sustainable design

3.1 Introduction

During the early 1970s, when environmental awareness was just beginning to surface, the public were largely unaware of the critical environmental issues that we are so familiar with today. Due to a general lack of knowledge, information, and awareness regarding green issues, people, at that time, did not feel under pressure, as they do today, to live in a more sustainable manner. Still, a few products are observed that have contemporary environmentally-friendly thinking, even though they were not intentionally delivered by designers at the time.

The products were more easily recognised after war time, using terms such as Postmodernism, Adhocism, Utility furniture and 'make do and mend', which are discussed further in section 3.2. This could be because sustainability had never been promoted in appealing or fashionable terms at the time. However, with the current focus on environmental aspects, they have the added value of sustainability. People's views can be affected by popular culture, and the influence of diverse eras and some designs have, unfortunately, served only to distance the public, such as Adhocism, as people have not been able to see a connection between their daily lives and the ideals of sustainability; however, some have flourished because they were advantageous for circumstances in which people lived in the past, such as make-do and mend.

In contrast to the past, green issues are broadly known to the public these days, and environmentally considered designs are easily cited. Both reusing waste materials in their original form for production, and also creating whole new raw materials by recycling waste materials, as discussed further in section 3.2, are becoming much more accepted and widespread.

It is necessary to acknowledge the designs of the past to reduce the chance of a designer duplicating design appearance. Thus, this chapter has reviewed design examples from the past considering the time period and contemporary design movements by comparing them to recent works that encompass environmentally friendly thinking. In addition to recent objects that refer to designs from the past, some other current designs have also been explored to see if objects utilise similar ideas to this study in the proposal of reusing waste materials. By investigating various creative design approaches from the past and present, this chapter aims to find products that will inspire and inform the creative outputs from this research project.

3.2 Past designs informed by current sustainable thinking and approaches

There have been 'green' designed objects for a long time, even before we knew of them as such. Crate (Figure 16) by Gerrit Rietveld in 1934 is a good model of current sustainable thinking applied at a time before green issues were so prevalent. In the

1930s, Europe was in the midst of a deep economic crisis: a time in which nothing was discarded. In 1934, Gerrit Rietveld made his first chair constructed of 'crate wood' using elemental constructions, and, later, it was as sold in do-it-yourself (DIY) packs (Drijver, 2001). Like many green designs that use discarded materials these days, Gerrit Rietveld utilised the discarded packaging as a raw material for his design. His reason for designing and making this chair was simply to reduce cost and was not intended to be environmentally sustainable, even though we would now consider it as such. This design is similar to contemporary sustainable designs that work with pallets, for example, Pallet Chair by Nina Tolstrup (Figure 17). The chair was originally designed for the '10, TEN, X' project at 100% Design 2008 and she created the pallet project for less than £10, made out of two pallets and 50 screws with the intention of responding to sustainability issues in design (Inhabitat, 2015). This designer encouraged people to make this pallet chair themselves (Studio mama, 2012) by buying downloadable instructions from the designer's website, which is a different way of providing goods compared to what Gerrit Rietveld did 74 years ago. However, the concept of DIY, using unwanted materials and changing the consumers' pattern of what they buy and use, are identical. Although Gerrit Rietveld's approach was informed and driven by the financial crisis a long time ago, Rietveld's ideas about packing are preferable methods for best environmental practice nowadays, with the flat-pack construction method used to reduce carbon emissions and the amount of discarded packaging materials.

Figure 16 – 'Crate' designed by Gerrit Rietveld in 1934. Made with discarded crate wood for packaging ©Archi Tonic.

Figure 17 – The Pallet Chair in 2008 by Nina Tolstrup. The image only shows the example of the final product that can be made through DIY and the image linked to the instructions for buying. ©Studiomama

These two comparable examples show how similar outcomes can be influenced by dissimilar philosophies of the time. If these two chairs were placed in front of an audience without information in advance, it would be assumed that both were made in a similar era or by designers who were working with a similar brief. The public these days would immediately recognise the materials that they are made from and some may even appreciate the up-cycled aspect of the design, confirming the growing awareness and acceptance of sustainable design. Following on from the above comparison between designs from different times that appear similar, this section investigates further the past design movements that have influenced the practical experiments in Part Two.

3.2.1 Utility furniture and 'Make-do and Mend'

During the Second World War and the post-war period, there were shortages of everything from food to clothes, which were subsequently rationed in June 1941 by the British government using a strict coupon system (Figure 18). Adults were issued as few as 36 coupons a year to spend on clothes, but a man's coat cost 16 coupons, trousers, eight, and a lady's dress or skirt, 11. Furniture and soft furnishings were also rationed (Summers, 2005, p. 80). In 1942, the British government introduced the Utility Furniture Scheme that continued until 1952. This utility scheme had been originally introduced for the cloth and clothing industry, but soon extended to furniture. The scheme was designed to meet the growing demand for quality furniture while using the least amount of material, as British timber and other furnishing material resources had been exhausted for the wartime industries. Under the scheme, only utility furniture could be manufactured and sold in furniture stores. Utility furniture was clearly stamped with the 'CC41' symbol (Figure 19), a mark originally taken from the utility clothing scheme. The CC41 utility mark was designed by commercial artist Reginald Shipp to identify the utility cloth. This symbol is interpreted as standing for 'civilian clothing' or 'clothing control' and often referred to as 'the cheeses'. After 1st November 1942, Utility Furniture, marked with the CC41 utility mark, would be the only type that could be produced and was only to be sold to those with a newly introduced 'Certificate of Need'(Mills, 2008, p.05).

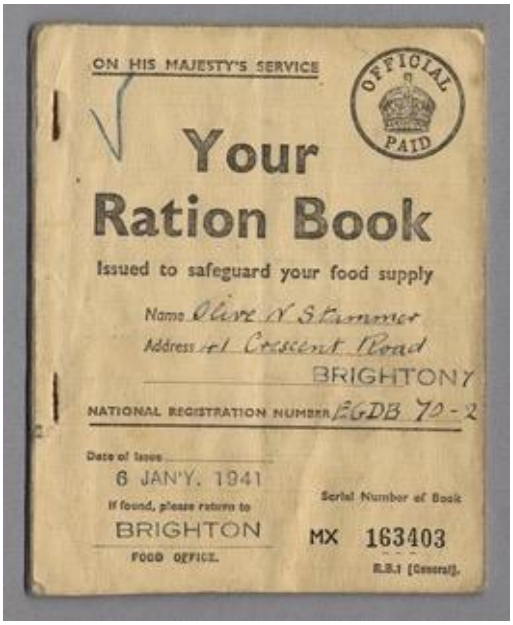

Figure 18 – This is a food ration book belonging to Olive Stammer of 41 Crescent Road, Brighton. The ration book was issued on 6th January 1941. Ration books were issued through Local Food Offices by the Ministry of Food. Inside the front of the ration book are the names and addresses of the retailers used by Olive Stammer to purchase food rations, e.g. 'Butter and Margarine Retailer', and instructions on how to use the ration book ©Brighton Museum & Art Gallery, Exploring Brighton Gallery.

Figure 19 – CC41 logo from underneath a chair of utility furniture.

At this time, the furniture was only available for purchase by people who had a 'Buying permit' (Figure 20). Each piece of furniture cost a certain number of dockets that were issued by the Board of Trade, for example, five units in 1944 would have been enough to buy a fireside chair or the bottom half of a kitchen cabinet (Mills, 2008, p.12). The utility furniture scheme specified that the standard piece of furniture would be made from at least 80% plywood (due to the lack of solid timbers) be structurally very strong, whilst using minimal amounts of materials. In the first original utility furniture catalogue, the president of the Board of Trades' introduction was as follows:

> Furniture, which is sound in construction, **agreeable in design,** and reasonable in price (The Board of Trade, 1943, p.01)

The catalogue showed the full range of utility furniture from living room, bedroom, kitchen, and nursery to miscellaneous (Figure 21). The range included everything you could want except a three-piece upholstered suite as the materials required for this would be excessive. In the catalogue, Charles Tennyson, a chairman of the Advisory Committee on Utility Furniture mentioned the general simplicity of the designs should make the furniture acceptable in its appearance as well as convenient and suitable in use. The rationale behind utility furniture design closely resembles today's sustainable design thinking in that it advocates the use of least amounts of materials to maximise quantity and minimise costs, with the added result of benefitting the environment.

Figure 20 – Utility Furniture Buying permit issued in 1946, contains only 30 units, which is adequate to furnish one room © Culturenet Cymru.

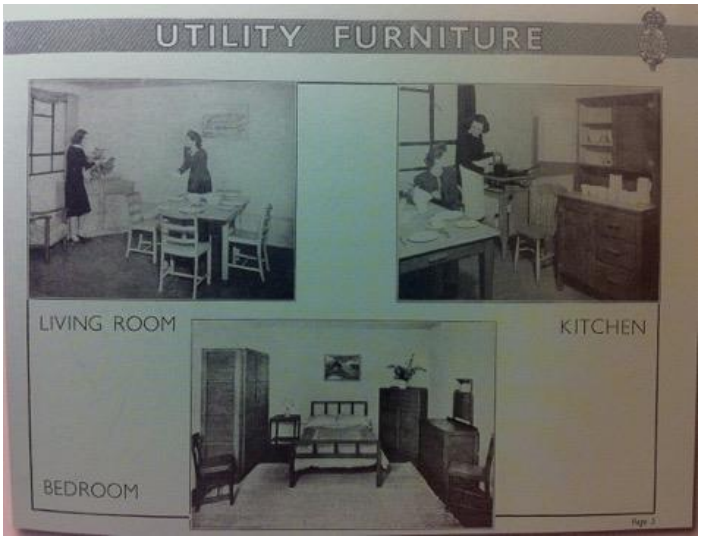

Figure 21 – Showing full range of the furniture in each room, The Utility Furniture catalogue, The Board of Trade, 1943, p.3.

Nowadays, the notion of utility furniture is still observed by some designers who are trying to make the most of raw materials in production, thereby reducing waste and also the energy needed for manufacturing. For example, the Pano chair (Figure 22) by Studio Lo, designed in 2008, is made from water-jet cut plywood and assembled using mortise and tenon joints. This construction means there is no need for the use of adhesives, screws, or nails. The chair's body is constructed from interlocking pieces all cut from one sheet of plywood. As a result of this smart use of materials

combined with modern cutting technology, the chair produces almost no waste. The compact chair design also allows it to be flat packed, reducing the space needed for transport and storage. The design of this chair is contemporary and minimal and in contrast to utility furniture, fits easily into the catalogue of desirable consumer products. Both utility furniture and Eco design furniture (Faud-Luke, 2009) are cast in the same mould – both are created under extreme limitations, but while one was designed to maintain a quality of life, the other's main motivation is the preservation of our environment.

Figure 22 – Pano chair by Studio Lo showing that all chair elements are from one sheet. ©Studio Lo

Another design methodology that arose from the need to be resourceful during material shortages during, and after, the Second World War was 'Make-do and Mend', encouraging thriftiness and increasing appreciation for the value of belongings. Make-do and mend was the wartime slogan during the Second World War and it encouraged people not to waste anything. In 1943, the Ministry of Information launched the Make-do and Mend campaign through a series of publications in an effort to help women and families get the most out of their existing clothing due to the severe shortages of materials caused by the war. This was an obvious extension of the utility products in times of harsh rationing that took place as the result of commodity shortages and the need to make everyday items last and provide longevity. People had no alternative than to repair the damage; replacement was simply not an option.

The standpoint of reusing and being inventive with materials became more and more necessary, and so the government issued a series of leaflets containing advice, in simple terms, on how to make fabric and clothing go the extra mile. Within this collection, a series of pamphlets including tips on repurposing curtains into dresses and instructions for turning old sheets into underwear was produced (Norman, 2007). It was also applied to furniture: if furniture was broken, you were encouraged to fix it yourself. In the book '*Make Do and Mend: Keeping Family and Home Afloat on War*

Rations' (Norman, 2007), a few methods of furniture mending during the war period are illustrated (Figure 23). An example of re-webbing a chair seat and an instruction on how to repair the table legs when they are broken are indicated. There was virtually no waste, as a usage must be found for almost everything. Even though, at the time, it was only a by-product of an economically advantageous scheme out of necessity and desperate conditions, the benefit to the environment cannot be ignored. During war time, following the scheme of Make-do and Mend was common sense in much the same way as we know how to recycle and separate our waste today. This campaign is a good example of when people are instructed to carry out a task repeatedly; eventually it becomes common practice. During the war, people could see the importance of saving and fixing and could understand instantly the benefit it had for their lives and that of their country, which is probably a similar reason to why people today try to recycle, even though it can be quite demanding.

Figure 23 – One of pages with furniture repairing in the Make Do And Mend leaflet number 11 issued by the Board of Trade, 1944.

Réanim, the medicine of objects (Figure 24), designed by a Parisian-based collective – 5.5 Designers – is a good example of how designers can encourage us to fix broken furniture with clear instructions. The chair in Figure 24 is one of their medicine projects and the acrylic adaptable prosthetic seat is a treatment used for the sick furniture: they like to use the term sick instead of broken as sick implies there is a remedy or 'seat medicine' that can be applied. In the 5.5 Designers' website, they explain 'Réanim':

> The aim is not to restore (a practice which seeks to re-establish something to its original state) nor to repair (an activity which involves utilising basic methods to prolong life) nor transform (changing the use of) but to re-educate furniture (by systemising the intervention). These doctor designers use deterioration, weakness, and alterations as a means to create.

> Their surgical operation gives back to the patient its initial function, and the perception of products. This new subject, which makes the object central to his worries, may cause the beginning of a true system of production. The cured object thus finds its place within its habitat and regains its right to live (5design studio, 2011)

This idea gives an option for people to take a piece of damaged or broken furniture, and give it a new lease of life. Both Réanim and Make-do and Mend pursue the same outcome, to prolong product life, but in dissimilar ways: one is a product and the other one is a guiding principle. The purpose is the same: increasing the life expectancy of the piece of furniture with a positive impact on the planet.

Figure 24 – The prosthetic chair seat for broken furniture. Designers only provide the seat as medicine for its treatment. ©5design studio

The furniture shown here explains the fundamental approaches of environmental design as minimising the material consumption in production, and once it has lived its first life, giving it another chance to live once again by mending its problems. These are most desirable actions according to the waste hierarchy (Figure 8) and many furniture manufacturers and designers are now trying to achieve this, as explained in Chapter 2. However, this is not what this study is trying to apply through practical experimentation as there is still waste created after the products' life expectancy. Yet, it has still influenced the design process as it is important to produce as little waste as possible during manufacture.

3.2.2 Adhocism

The term 'Adhocism' was first used in architectural criticism by Charles Jencks in 1968 when he published *Adhocism: The Case for Improvisation with Nathan* (Silver, 1972). This movement was in the same era as Postmodernism, but Adhocism suggested more critical design strategies by observing people's behaviour and using extemporaneous ideas and readily available materials to solve immediate problems rather than creating a specific product to do the same thing. This book describes 'Adhocism':

> It can be applied to many human endeavours, denoting a principle of action having speed or economy and purpose or utility. Basically, it involves using an available system or dealing with an existing situation in a new way to solve a problem quirkily and effectively. It is a method of creation relying particularly on resources which are already at hand (Jencks and Silver, 1973, p.09)

The cover page of *Adhocism* illustrates a classic example of the movement that was designed by the author himself (Figure 25). The chair was made using materials already in existence and easily available, but uncommonly used in furniture making, namely steel gas pipe, black plastic foam insulation material, wheelchair wheels, bicycle axles and bearings, auto bumper bolts, chromed tractor seat, fluorescent vermilion paint, and lacquer. The ad hoc chair is one of many ways to approach eco design. It advocates cutting down the process of making things with raw materials and using things to hand instead. To support the movement in terms of recycling, one of the leading online media sites Treehugger (2009) listed it under their 'sustainable product design' category. There are some articles with ad hoc design examples in the media written by Lloyd Alter, design editor of Treehugger, and one of these examples is a coffee table made from pipe wrenches by Jonathan Niemuth in 2010 (Figure 26). This is a perfect fit for Adhocism in contemporary design. The table used ordinary objects, a pipe wrench sold in tool shops and transformed it into a new extraordinary life as a table. This movement explored the art of living in a positive, ad hoc manner by engaging already available materials for new and innovative purposes.

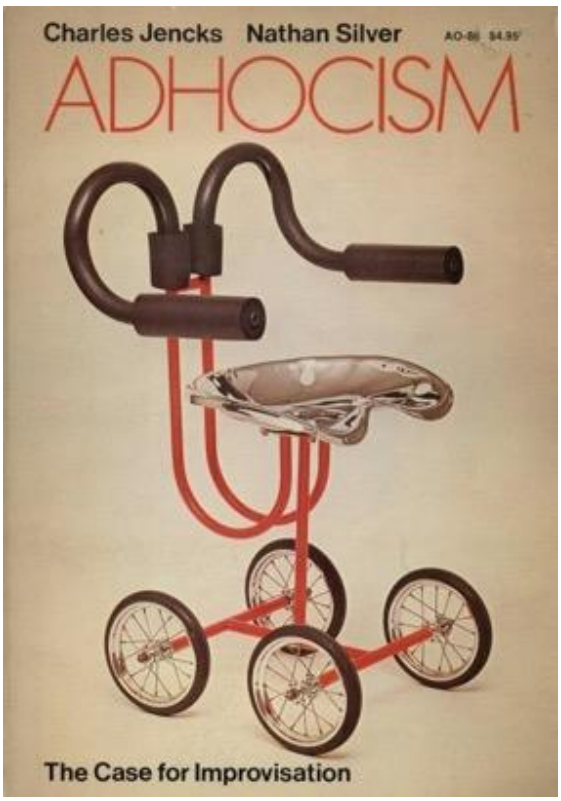

Figure 25 – Ad Hoc chair by Silver, Nathan on the cover image of Adhocism in 1973. This is the most famous chair from the movement. ©Anchor book

Figure 26 – Pipe wrench coffee table by Jonathan Niemuth, inspired through working in construction. ©Treehguger, 2009

The term Adhocism is not always familiar to the public even though it is in common use today; for example, rolled newspapers are used as boot keepers, paper is used as a bookmark for referencing (Figure 27), a cup is used for measuring portions of food instead of a vessel for drinking, a chair acts as a coat stand and a ring is utilised as an end for a pull light switch (Figure 27). Adhocism essentially refers to constructing products from various readily available materials or those to hand; these improvised ideas constantly appear unexpectedly in everyday life. The difference between the results of improvised ideas produced by designers and public might be that the designer's outcome may look more deliberate and considered. This is inevitable as when the public produces an adhoc design it is normally out of necessity to solve an immediate problem and is almost always needed for a practical purpose so the aesthetic of the 'design' is not an issue. Designers on the other hand consider both the function of the object as well as its visual appeal. A good often-seen example to explain these two contrasting approaches to Adhocism involves pre-loved cups and saucers (Figure 28). One is an off-the-cuff idea in which rescued old or chipped cups and saucers are used to grow a selection of window herbs and the other is a carefully arranged cake stand made from the same pieces or even used broken pieces of vintage crockery to make plant labels were first introduced at the London design festival, made in Clerkenwell in 2010 (Figure 29). Both are practical, but one is definitely more considered in a creative and imaginative way.

As Adhocism involves finding new uses for existing items, there is no new production for the design and no waste creation, therefore, adding sustainable value through the reuse of the unwanted item. This movement has provided a great deal of inspiration for the design practice in this study as it is believed to be the best way of applying material to hand; it does not incur additional material costs or produce additional waste, which is a priority of this study. Also, this method of experimental fabrication by adding the designers' craftsmanship and understanding of materials to an existing piece has become the author's main deliberation on own practice as a designer to show an idea of alternative suggestions using waste materials.

Figure 27 – Example of 'Adhocism' in daily life; Left: the receipt is used instead of bookmark, illustrating the contrast between Post–its and unexpected paper in the same concept as a Post–it; Right: using a ring as a pulling light switch handle in a shared house ©self-taken.

Figure 28 – Reusing teacups and bowls as plant pot, 2016 © Upcycled Wonder

Figure 29 – Designer and illustrator Esther Coombs repurposed pieces of vintage cup and saucer to cake stand (left) and pieces of broken vintage crockery to form plant labels (right) in 'Made in Clerkenwell', May 2010. ©Stylist's Own

3.2.3 Postmodernism

Postmodernist designers rejected many of principles of modernism which believes in simplicity, purity, clarity, and equality for everything and everybody; Postmodernism is against these ideas. Postmodernism is clearly defined as an important movement in architecture and design during the late 1970s and became a phenomenon in the early 1980s. The postmodern designers from this period did not agree with minimalism in functional and found the uniform objects which could be produced in factories too simplistic. They thought that Modernist design had lost its individuality, humanity, and naturalism. Postmodern designers wanted to improve this through design, architecture, culture, and sociology. Reaction against the semantic limitations of Modernism was not restricted to industrial design, but it was also present in decorative and applied arts and architecture. Postmodernism followed these ideas, rejecting boundaries between high and low forms of art, rejecting rigid genre distinctions.

The design exhibition 'Postmodernism: Style and Subversion 1970–1990' by Glenn Adamson at the Victoria and Albert Museum in 2011, explored Postmodernism's radical ideas. The first impression of the exhibition for the author was curiosity about its popularity, regardless of understanding the background and inspiration for the birth of the movement. Is it really a necessary movement? Objects seemed to require additional processing through adding multiple colours, irregular shapes, and various materials. While it is comprehensible through visual design aspects, as these were innovative works that opposed modernism and became a brand-new style at that time, they often made no attempt to be sustainable. For this reason, it is surprising to see the Consumer's chair (Figure 30) by Stiletto in 1983 that displays current green sentiment and sustainable design thinking by using a waste shopping trolley for its main material. The designer of the chair Stiletto said,

> 'I used containers taken from the everyday consumer cycle as my starting material …. Redesign here has less to do with

> recycling and more with rebirth. The design is about soul and character …' (Vegesack and Alexander, 1996, p.228)

It is interesting to note that, despite knowing he is reusing the second-hand object, he emphasises the character of the design rather than its sustainability. A very similar designed outcome can be found in the Annie Shopping Trolley Chair (Figure 31) by UK designer Max McMurdo in 2001 as in the Consumer's Rest Chair (Figure 30). However, although both are constructed using a discarded shopping trolley, the inspiration for the two designs is completely different. Through the design of the Annie Shopping Trolley Chair, McMurdo tried to show that rubbish can be transformed into a not only beautiful but functional and comfortable chair:

> 'Given a new lease of life and totally transformed into a cool chair. Discarded shopping trolleys cause huge environmental issues; they pollute waterways and cause hazards to wildlife!' (Reestore, 2017)
>
> 'You've still got to be able to identify the original item to have that impact. I want people to think 'that chair looks like an old shopping trolley but it can't be because it looks too nice. (Home and Garden, 2012)'

If the design by Stiletto in 1983 (Figure 30) was about soul and character, the chair by Max McMurdo in 2001 (Figure 31) was all about recycling.

Figure 30 – This chair was shown ('Consumer's Rest' chair in 1983) in the Postmodernism show at the V&A Museum September 2011. It is now seen as one of the icons of Postmodernism.

Figure 31 – 'Annie' shopping trolley chair designed by Max McMurdo in 2001, sold through Reestore ©Reestore

Another significant chair of the Postmodern era is the Rover designed by Ron Arad in 1981 (Figure 32). Arad's first prototype piece was composed of two ready-made materials, a scrapped car seat from a Rover 200 car mounted on a frame made of Kee-Klamp scaffolding. A quote from the Geffrye Museum, London:

> The use of found materials is characteristic of the post-punk style of furniture made by British avant-garde designers in the 1980s. Arad described in an interview about producing the Rover chair in the 1980s that he 'never thought of myself as a designer then, more as a friend of Marcel Duchamp' (Geffrye Museum, 2017).

The inspiration behind the design of this chair can be seen from Arad's sketch (Figure 33) at the Barbican Centre in 2010. Ron Arad left a little note beside the Rover chair sketch, which reads, 'To explore beauty where it's normally hidden'. Although his principal idea was not to save discarded objects to make a new functional product in an environmentally friendly manner, the resulting design does reflect the spirit of sustainability by using salvaged materials.
Both *Consumer's Rest* and *Rover* (Figure 30 and Figure 32) use discarded materials; however, the explanation of their concept is not implied within a sustainable context. If the objects are compared in appearance, Postmodernism seems to correspond to sustainable design thinking, but differs from sustainable design in its attitude towards a lot of these trends. Postmodernism does not lament the idea of fragmentation, provisionality, or incoherence, but rather celebrates it.

Figure 32 – 'Rover' by Ron Arad. Tubular steel frame supporting a salvaged Rover 2000 car seat, manufactured by One-off London from 1981 © Geffrye Museum

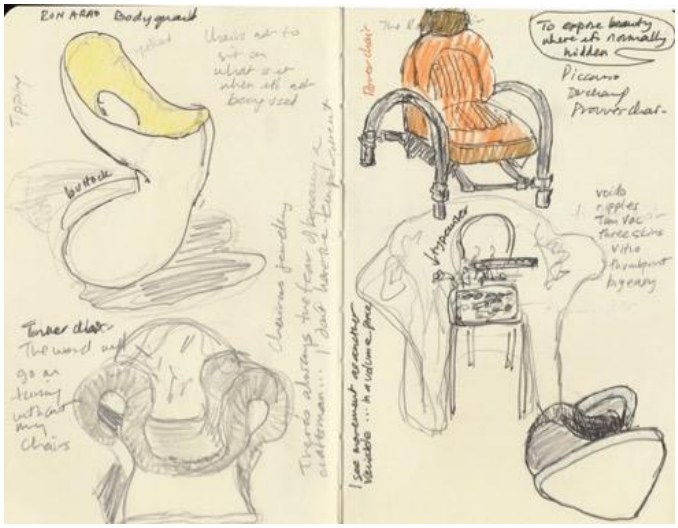

Figure 33 – Ron Arad's design sketch at the exhibition of Ron Arad: Restless at the Barbican Centre in London 2010. © Ruth Rosengarten.

3.3 Contemporary sustainable design

In addition to the designs shown in section 3.1, which have embraced waste minimisation, use minimal material consumption in production, and waste material reuse, there have been more diverse environmentally considered design approaches, such as using recycled materials, the development of sustainable materials, and the reduction of energy consumption. However, less familiar designers are investigated in this section, instead of exploring existing established designers who have found success with environmentally sustainable products as a design strategy, such as Piet

Hein Eek,[25] Michael Marriot,[26] and Tom Dixon;[27] the rationale for this research is an attempt to discover the most beneficial practice for design entrepreneurs.

3.3.1 Design examples of sustainable material focused furniture designs

In September 2017, at the famous annual international design show, the London Design Festival (LDF),[28] an innovative piece of work *Mycelium + Timber* (Figure 34) by designer Sebastian Cox with Kingston University researcher Ninela Ivanova at Somerset House was shown as part of the Design Frontier exhibition. They investigated the potential use of natural material in everyday commercial objects. This team managed to structure light shades and stools using a combination of mushroom mycelium and discarded goat willow slices.

> I've always had a kind of fantasy interest in 'reinventing' a type of MDF and finding new ways to bind wood fibres into either sheets or mounded forms, ideally without glue (Dezeen, 2017)

This product showed the positive result of how sustainable raw materials can be made without destroying the natural resource. Yet, the work is still in a conceptual form and it has not yet been proven if this can be up-scaled to be compatible with the current product and furniture industry in the near future, when it is most needed.

Figure 34 – 'Mycelium + Timber'. Inside of pendant light made using the fungal material. The goat willow scraps are sliced up to create thin, strips and woven together to create individual moulds (by Sebastian Cox and Ninela Ivanova, 2017).

[25] Piet Hein Eek developed the iconic Scrapwood Collection in reaction to the problems created by traditional mass manufacturing. Working with reclaimed materials, he turns potentially wasted offcuts into desirable pieces of modern furniture with artisanal appeal. SCP. Sep.2017

[26] Tom rose to prominence in the mid-1980's as 'the talented untrained designer with a line in welded salvage furniture'. Design Indaba. Sep. 2017

[27] A keen reader of design history, Marriott is known for an open spirited kind of work that often makes use of pre-existing materials, manufacturing techniques or reclaimed objects.

SCP. Sep.2017

[28] The annual festival for showcasing the work of designers, architects, artists and retailers since 2003 to celebrate and promote London as the design capital of the world, London visitor guide, 2017

Like in this mycelium project, materials are now able to foster and encourage sustainable design practises by transforming from natural materials or waste, such as Newspaper wood (Figure 35). This new material has been developed by the Dutch design label Vij5 using everyday discarded newspapers and natural glue, creating a recycled material designed for other designers to use as a raw material. This new material – newspaper wood – was introduced in 2003 by Mieke Meijer and the first piece of furniture design to use it was *Framed* (Figure 35), exhibited and brought to the market in 2011 after a long development period with these new reproducible materials. Newspaper wood shows a reversing of the traditional production process; not from wood to paper, but from (news)paper to wood. When a newspaper wood log is cut, the layers of paper appear like the lines in wood grain or the rings of a tree and therefore resembles the aesthetic of real timber to be treated like any other type of wood (Vij5, 2017). This material had issues with the length limit and required a veneer for longer pieces of work due to its lack of strength. Lack of strength and the need to improve the time and cost of production, as it was originally only manually processed, were the two main issues with the product. Since 2011, after much experimentation, this product can now replace some wooden objects such as flooring, cabinet doors, drawer fronts, shelves, and lamps, and is still being developed to find new intermediate products and innovative applications by mixing other materials or adding colours.

Figure 35 – 'Newspaper wood' by Vij5 (above) and 'Framed' by Breg Hanssen using newspaper wood (below).

These two material-focused designs demonstrate strong environmental responsibility and have a beneficial impact on the planet. Given that the earth has limited reserves, this type of experimental approach is paramount in advocating a way to save the planet by using only completely natural resources in the future. This type of design is also a sustainable process in that waste materials are returned to the paper-recycling chain.

Another type of recycling has been applied in the Alchemist's Furniture series (Figure 36) by Studio Woojai. The table is one-of-a-kind, employing the recycled content of old newspapers to make the product. The designer explored the material available, transforming it into a different element through the application of the recycled newspaper method, a technique that yields fully functional products with their own unique aesthetics.

Figure 36 – Alchemist's console, a lifeless material from old newspapers has been given a new life as a furniture element © Studio Woojai, 2017.

3.3.2 Design Examples of energy efficient furniture designs

Another important contemporary eco design issue is the reduction of materials and packaging in design to avoid large amounts of energy consumption. This aspect of green design is all about using fewer resources and generating less waste. This idea normally manifests itself as flat-pack furniture or a design in which the packing itself is transformed into tangible objects. The finish-it-yourself (FIY) chair (Figure 37) by David Graas, designed in 2007, includes both aspects. This children's chair is designed to allow the components to be popped out of the packaging and the pre-cut parts put together in much the same way as a puzzle, making it fun and interactive. FIY is made with 100% cardboard without adhesives or screws, therefore it can be 100% recycled. As the elements of the structures are the packing itself once it has been constructed, the waste is minimal. Also, as the chair is produced flat and square shaped, it is easy and economical to transport. Industrial societies could easily incorporate this feature during the raw material stage of manufacturing and make

reducing cost a priority of production, while making the manufacturer as environmentally friendly as possible.

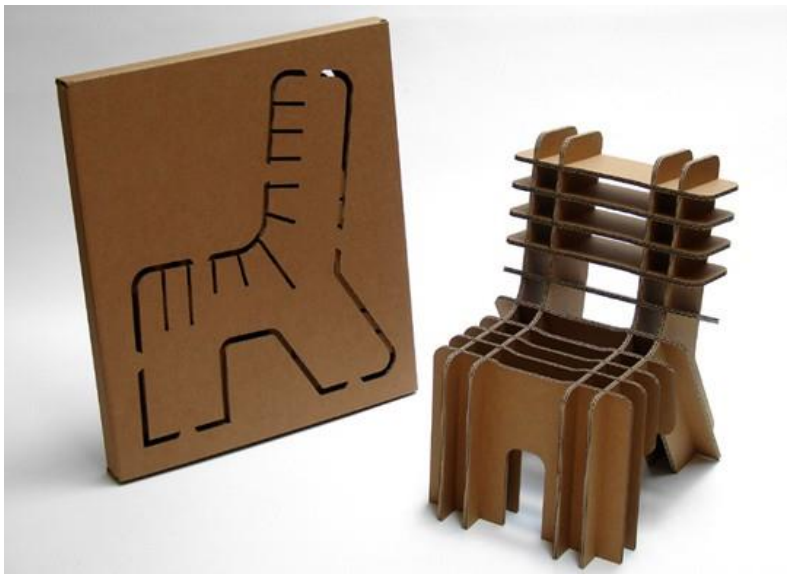

Figure 37 – FIY chair by David Graas in 2007, which comes in flat pack for delivery and can be built using the packaging as structural elements of an actual furniture piece.

Grown-up Stool by Christopher Cattle (Figure 38), as mentioned in the literature review, brought a whole new idea of considering the manufacturing process even before the timber had grown. 'Trees are self-generating, and the only energy needed is that which the sun provides worldwide. It's free and it's non-polluting' (Cattle, 2002). Cattle has established a production process for furniture using the efficiency of a growing organism from renewable materials through the use of jigs for training a growing tree. Regarding this design, *Eco Design (Fuad-Luke, 2009) and Green Design (Fairs, 2009)* has stated that 'furniture is just like harvested crops'.

Figure 38 – Grown-up furniture stool in 2002 by Chris Cattle ©Eco Design.

All of the above design developments are examples of products that can provide environmental benefits in future production, but still cannot resolve the issue of current or future furniture waste. Although waste creation can be reduced through these designs, there will still be brand new waste produced. This study does not consider future scientific discoveries, material advances, or energy efficiency, but rather concentrates on immediate action on urgent environmental issues, especially waste, as another way of helping the planet for the future. This study has specifically explored design using carefully sourced existing materials or reusing discarded furniture to lessen the embodied energy of the products in design practice.

3.3.3 Design examples of reusing furniture waste

A few designers, who have similar thinking on the practice of using waste materials, have also been reviewed to avoid producing indistinguishable results and only a few designers, including Furniture Magpie, who use this technique of re-appropriation with components and materials from furniture waste, have been found. Examples of this form of redesign include a coat stand that is made utilising discarded dining chair legs by Furniture Magpies (Figure 39), discarded drawers that have been transformed into storage units with a new carcass made by Design Direct (Figure 40), works by Zoë Murphy, who applies colourful character onto unwanted old furniture (Figure 41), and James Plumb's restoration of furniture frames by adding casting concrete seats (Figure 42). Waste produced from previous furniture manufacturing remains the designers' responsibility, as the furniture waste created by these designers has become a troublesome matter for future designers. Thus, findings from the past and present have informed and supported design decisions in practice with various attitudes to solving the problem of furniture waste for a small scale designer maker.

Figure 39 – Come Walk With Me coat stand © Furniture Magpies in 2011

Figure 40 – 1,000 drawers by Design Direct in 2011, © Design Direct.

Figure 41 – Margate series by Zoe Murphy, launched in 2008.

Figure 42 – To Have and to Hold by James Plumb in 2010.

3.4 Summary of chapter

In the past, green or sustainable design has been touched on, particularly in post-war design, which often reflects the feelings and character of the era; this was out of necessity due to material and labour shortages rather than an awareness of environmental issues. This chapter has introduced the historical context of ecological design to provide a better understanding of what sustainable design is and how it has developed and progressed over a short number of years by comparing past and current designs with sustainable values.

Observations of designs through history, designed with an environmentally friendly view, inform us that although the methods and reasons behind works are un-associated, it can be resulted in products that tend towards being green. The similarities and common threads running through modern sustainable design, Postmodernism, Adhocism, Utility Furniture, and Make-do and Mend, include the use of reduced and reused materials in products. There are design examples in history that have incorporated recognisable contemporary environmental benefits by minimising materials, mending, or reusing, although the conceptual contents were diverse; Postmodernism loves individuality, humanity, and rejecting boundaries between high and low forms of art, rejecting rigid genre distinction; Adhocism likes to present the improvisation of objects in any circumstance and subverts the approved method and predetermined result in virtually all human activity. Findings from investigating design in the past show that environmentally friendly design was a consequence of enforced living conditions, whereas, today, the environmental terms of designs were born out of a concern for the future of our planet.

In opposition, sustainably concerned designers approach their practice from a range of different perspectives, multi materials, and user-friendly methods, for which no complicated instructions are needed and which provide a straightforward adaption of broken furniture; some designers are establishing new forms of materials or production. However, all these efforts are not widely known and used, but are more like a manifesto or campaign highlighting the importance of the recognition of green issues and changing the behaviour of people. As the author believes that a *solution* for the problems should be proposed, not only their identification, this study includes a practical experiment to produce designs for an alternative solution for the green issues.

Reviewing three specific movements from the past with the viewpoint of sustainable design and current sustainable approaches that this study can apply for the practical experiments are:

- adherence to materials and production methods that are currently available;
- observation of people's behaviour and use of extemporaneous ideas and readily available materials to solve immediate problems;
- the majority use of waste materials to lessen another source of new waste creation;
- reuse of every element to achieve maximum efficiency with minimal demands; and
- expression of the original form of the waste material for its uniqueness.

Chapter 4. Public perception of products made from waste materials

4.1 Introduction

A business is any organisation that makes goods or provides a service (BBC, 2017) and creates profits from operating. Back in the 1970s, American economist Milton Friedman said:

> The social responsibility of business is to increase its profits
> (The New York Times, 1970)

This still holds true for many businesses. Being self-employed for the purposes of this study refers to those getting a salary through the production of their work. The Cambridge Dictionary states 'business' is a work that earns money (Cambridge Dictionary, 2017). There could be many other diverse reasons why people have their own firm, but for all those featured, the reality is that gaining and maintaining income is inescapable for making a living and supporting themselves.

After the inspirational findings from past designs in the past, as a craftsperson and designer maker, knowing consumer's shifting opinions on making products from waste and maintaining knowledge of products in the market is crucial, especially for those in this study as small design businesses. To get an idea of the market and user needs and opinions on the products, waste materials, and to detect potential markets, a survey was conducted through one of five case studies. Furniture Magpies, the researcher's prior company, together with a focus group, which was run alongside a student project from Bucks New University. This survey was conducted via the exhibition, at which the object's appeal caught the public's attention to illustrate the possibilities and encourage participation. The survey design and data analysis are discussed further in section 4.1.

This chapter encapsulates examples of products that have changed people's perspectives within the market, which gives an idea of how designers and their work can be part of the solution, providing a positive impact on the environment. Thus, section 4.2 seeks suggestions of realistic design solutions from current products that can help to improve on this study's design practice and outcomes.

4.2 Design possibilities of products made using waste material

4.2.1 Data collection on people's perceptions

A survey was designed to gauge the public's perception of waste and products made using waste materials (see Appendix 1), and it was carried out over two years in three different venues between 2012 and 2013. Twice in 2012 and 2013 at the Vitra showroom London, twice at Bucks New University, High Wycombe, and at the Furniture Magpies' exhibition during the 2012 London Design Festival. The questionnaires used for the survey at each venue were identical up to question number 4, to obtain data regarding gender, residence, age, and design terms for

environmental concern. As this study is focused on the UK market, figures relating to region, gender, and age group were essential to analyse and understand targets in the marketplace through questions 1 to 4. However, questions in relation to pricing and the rationale for consumer's favourite products, were altered slightly and located in different parts of the survey as the product shown were distinct and different for each survey (see Figure 43, Figure 44 and Figure 45). The reason for designing this survey method for delivery through the exhibition was to encourage participation by attracting, contextualising, and inspiring using three dimensional objects rather than simply asking participants to read and answer the paper questionnaire.

The products were presented at Vitra, London and Bucks New University, High Wycombe and were all designed and made by MA Art and Design students from Bucks, as the first project of their academic year. There were eight students with objects in 2012 (Figure 43) and 11 students with their designs in 2013 (Figure 44) using waste materials. The brief for the product was called Beautiful Waste (see Appendix 2). It asked the students to imagine that they were Charles Eames and to produce a small model of his latest design, but this must be made primarily of, or be inspired by, waste and must be functional. All the works were displayed on an individual plinth, and each plinth had its own mark-able front board for the public to assign a simple rationale for their favourite work. This stated: 'It's clever; It's funny; It's beautiful; It is green; It is easy to make myself', and alongside this, people were invited to complete a simple questionnaire sheet to collect data (see Appendix 1).

The questionnaire sheets answered during the Furniture Magpies show in Tent London 2012 were slightly modified to gain an understanding of customer's views on products that were already selling in the market rather than prototypes such as those that Bucks students designed and made for the Vitra shows. The object shown in the show was one of the best-selling items of Furniture Magpies, *Tweet Tweet Door Wedge*, which is made from the top part of a leg from a discarded dining chair.

At that time, the door wedges were sold in two versions, with a wax finish and without a finish, but a painted edition was added primarily for research during the event (Figure 45.) As with the other demonstration sites, Vitra and Bucks New University, the questionnaire sheets were provided to interrogate a trading and market rationale and a willingness to purchase products made using discarded materials at a commercially realistic retail price.

The final question in the survey asked for views regarding the necessity of reducing and recycling (including reusing) of waste, and gathered qualitative data of suggestions for possibilities for the commercial market using waste materials.

Figure 43 – Beautiful Waste – products designed by Bucks New University MA Furniture design students inspired by the work of Charles and Ray Eames. 28.02.2012–01.03.2012.

Figure 44 – Beautiful Waste – products designed by Bucks New University MA. Furniture design students inspired by the work of Charles and Ray Eames. 21.02.2013–12.03.2013.

Figure 45 – 'Tweet Tweet' door wedges in three different versions with survey sheets in the show at Tent London 2012, 20–23 September 2012, by Furniture Magpies.

4.2.2 Data analysis

Collected data was analysed using Microsoft Excel (see Appendix 5). The results proved positive to this study with affirmative responses from the public regarding products utilising waste materials.

The number of survey participants was 165 with a 9% difference between male and female respondents.
This study asks the fundamental research question regarding people's opinions on current waste and environmental issues and asks them to select a preferred stance regarding prevention and recycling. The majority of people answered that waste needs to be recycled (Chart 1). This result assists this study as it highlights public awareness of the need for waste processing. A few people responded 'both – prevention and recycling' and some comments show a greater awareness of current waste treatment thinking:[29]

- In order of priority, 1. minimise waste at source, 2. re-use, 3. re-cycle
- There's not much stopping the waste at source, so I would say recycle
- Stop at source. Recycling still uses energy, unless we reuse (leave as it is)

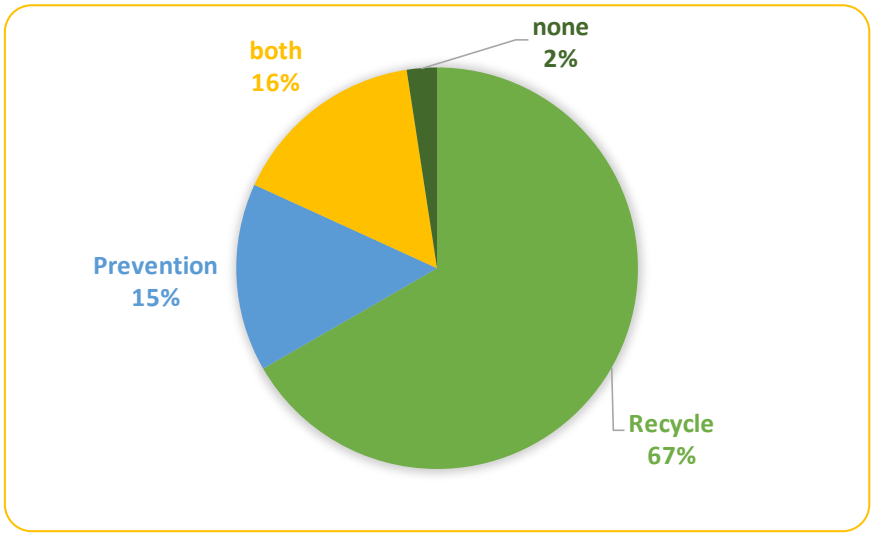

Chart 1 – Public's opinion on the waste issue

The survey has also explored how many design movements and terms are familiar to the public regarding how design can have a positive impact on nature, such as eco-design, environmentally friendly design, sustainable design, green design, recycling, energy efficient design, or upcycling. Of all respondents, 85% ticked boxes of at least more than half of these terms, which is surprising high, showing that some have come into general use and environmental issues are familiar to most people. The most recognised term was 'Recycling', with 94% of people being aware of this, presumably due to its use in numerous places and the fact that it has become part of life in areas such as food packaging and recycling symbols (as illustrated in Part 1, Chapter 2).
An noteworthy outcome from the data collection is that the public's choice of favourite designs in the exhibition is not because of their 'green-ism', but because of their creativeness (Chart2 and Chart3). Voting through the focus groups in 2013 shows that 46 out of 82 people chose the reason for their favourite product as 'it is clever'. The winner for the poll was *Help me to find Margherita* by Kamal Wasala (Figure 46), which is a moving robot made from an old pizza box, encouraging people to make

[29] Answers from participant for survey though exhibitions, 2012 and 2013

something similar with their children using a template provided. People enjoyed the idea of interaction as it has moving arms controlled by pulling a thread, and the liked the fact that it was a creative solution made out of waste: the cleverness and irony of transforming waste into a moving toy. Another example is the *Tweet Tweet Door Wedge* (Figure 47) by Furniture Magpies, made from off-cuts of discarded dining chair legs. People like the product for its beauty and function, not necessarily for its environmental consideration. One unpredicted outcome from the survey with Furniture Magpies, is that the public preferred products with a finish, and are ready to pay a slightly higher price than the original condition of the material when it is a finished piece. As the products are physical present and viewed, people are captivated by their appearance and when they discover the back story of using waste materials, they become more interested in the environmental considerations. This shows that however compelling the environmental back story of a product, it is still of utmost importance that it has appeal on an aesthetic and functional level.

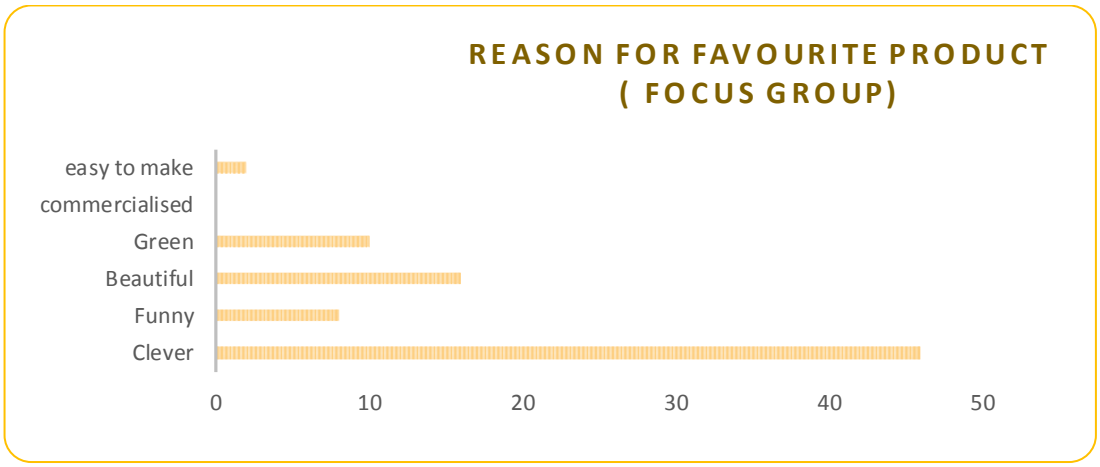

Chart 2 – The reason for the audiences' favourite product (Focus Group)

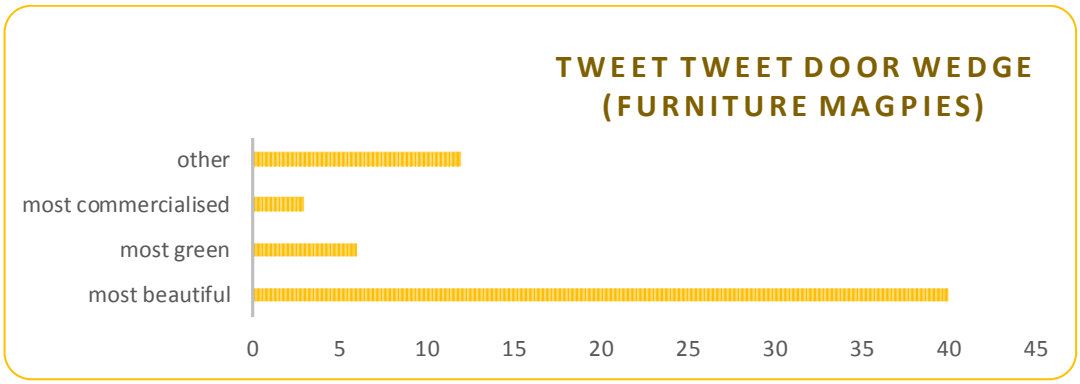

Chart 3 – The reason that audiences like Tweet Tweet Door wedge (Furniture Magpies)

Figure 46 – Help me to find Margherita by Kamal Wasala is a moving pizza box robot with thread puller @Self taken

Figure 47 – Tweet Tweet Door Wedge by the Furniture Magpies in 2012

This research is centred on the UK market to inform on potential markets to designers in the chosen case studies. Of the total participants, 60% are UK residents and only their data has been analysed. Specifically, the group who replied that they are willing to buy products made using waste materials (half of them being UK residents) was inspected by age group to see the potential market. A range of age groups have been divided into ‘under 22’, ‘22–45’, ‘45–65’, and ‘over 65’, and 90% of people who answered ‘Buy it’ regarding the products are aged between 22 and 65 years (Chart

4). This chart shows the interest among the potential UK market of commercially produced items using waste materials and where this study should aim when targeting the UK market.

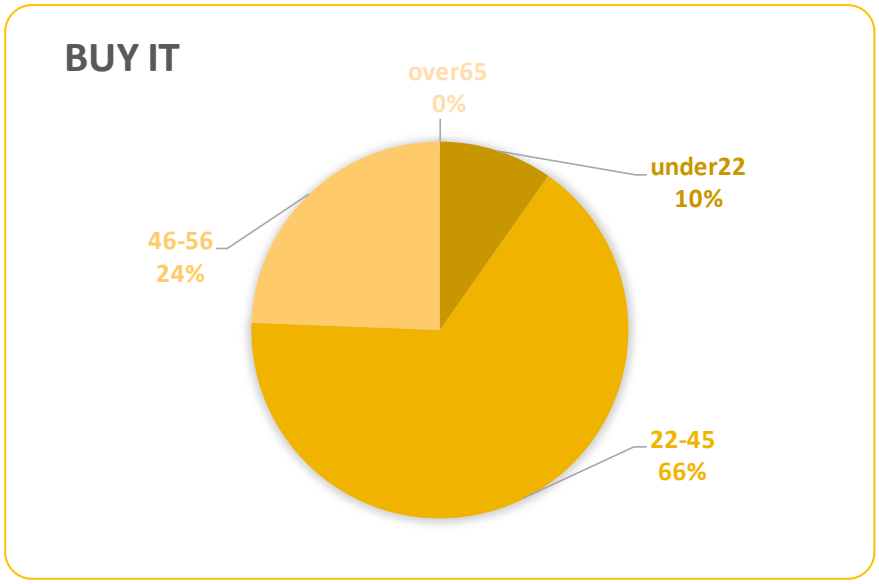

Chart 4 – Willingness to purchase products from waste - UK Participators by age group

From the discussion regarding the necessity of commercial products using waste materials, some opinions of consumers have been noted:[30]

- Resources are running out. Each old piece has a history/story behind it. Good for recycling;
- It is if they are well-made;
- I like the idea as it is good for environment, but also, it would be great if it has beauty in it;
- Fantastic, less landfill.

Applying these findings from data analysis to the development of the product is seen as crucial to reflect on public perceptions and manufacture products that are ready to sell; this has been considered to inform design practice.

4.3 Popular products made using waste material in the current market

Some products already in the market seem to encapsulate aspects that the public desire: beauty and a clever way of using waste material. There are two brands that have been considered from the findings of this study through survey mentions, making their name popular: Freitag and Elvis and Kresse use waste materials and produce fashion sector items. Although these two businesses are not furniture-waste-related, they have still has been observed to see the difference between the materials they used and furniture waste, and to learn how their methods can be applied to own practice to be commercially viable.

[30] Answers from participant for survey though exhibitions, 2012 and 2013

4.3.1 Freitag bag

Freitag bags (Figure 48) are one of the first and most commercially successful design cases using discarded materials from old truck canvases, recycled bike tubes (for the piping), and recycled seatbelts. The beginning of their business was small as they were looking for a strong waterproof bag for themselves, which was not possible to find on the market at that time; they first decided to make one in 1993. Freitag is named after Swiss brothers Markus and Daniel Freitag, and the business has had huge success worldwide; the name has become their trademark. Freitag had several exhibitions featuring their bags in museums all over Europe and in May 2012, they had an exhibition called 'Out of the Bag' at the Museum of Design in Zurich. The curator of the museum, Renate Menzi said (Freitag, 2012) :

> The company is like born for one product, one bag. It is 20 years ago … Another aspect of this company is design, all about design, graphic design, communication, and product design is important to this company.

Freitag's success comes from their design as each bag is unique with different colours, markings, and contours. Another key element of their design is their 'green' credentials using second-hand materials from original truck tarpaulins. Consumers love the design aspect and the idea of producing it with used materials; 'Green bags: brand new and used materials (exhibition title in 2008). Simon Krenger, a blogger, while reviewing the Freitag bag, explained that he loves the simplistic design. There are many similar bag makers, but none have such huge success with their business. People like to buy Freitag bags and while the reuse of waste material is initially not a major concern for buyers, the colour, quirkiness, and functional aesthetic is.

Figure 48 – From truck to bag, illustrating the manufacturing process of Freitag bags from beginning to end ©Freitag website www.freitag.ch.

4.3.2 Elvis & Kresse

Like Freitag, there is another well-established brand producing fashion accessories from upcycled waste: Elvis & Kresse (Figure 49). Decommissioned fire hoses, salvaged from British fire brigades, are the main material for this brand. As the raw material is second-hand, it always needs to be cleaned of all the soot, grease, and everything else that builds up after 25 years of active duty. Elvis & Kresse says it has found beauty inside its textiles and the business has been set up to rescue as many of the hoses as possible from landfill. The company started in September 2007, selling belts designed by Henrit (Elvis) on the company's and the fire brigade's websites, and

via a third-party shop in Camden, North London. However, selling only one item limits their commercial success.

> 'We had a great material with a good story behind it, because everybody respects firemen, and we were upcycling a waste product – but to be commercially viable we had to expand into other products' (Financial Times, 2011)

Because the waste material only comes in certain sizes, the making and designing of the goods have to be done by hand. The company insists its design is sustainable using rescued raw material and world-class craftsmanship with timeless design (Elvis & Kresse, 2018). This is what consumers love about this design with its uniqueness and individualism from the materials' previous life. The material itself has a unique quality, which makes it unlike leather or other man-made materials; each piece has a unique patina and feel, adding to the sense of history and provenance of the product.

Figure 49 – The Elvis & Kresse Compact Briefcase is made from genuine decommissioned fire-hose and the lining is reclaimed military-grade reclaimed parachute silk. © Elvis & Kresse, 06. 2018.

4.4 Summary of chapter

Because this study is being conducted to encourage new design entrepreneurs to utilise waste for their products, the delivery of the view on market possibilities is inevitable. Thus, this chapter investigated whether there is a potential market for products using waste materials through a consumer survey to analyse their perceptions and interest in purchasing. With the student project at Bucks and Vitra, participants of the survey were more open-minded; they appreciated the development and concept of a product and agreed to the possibility of a marketable commodity. By creating an integrative survey through the exhibition of three dimensional objects, a total of 165 people answered the questionnaire and 67% of these stated recycling is the most pressing need for a solution to the waste problem. This result assists this study as it highlights the need for thoughtful waste processing and reuse. Following this finding, the survey focused on the market possibility in the UK and the age range 22–65, the most economically active and engaged from the data collected. In

response to the question of whether they are willing to buy a product using waste materials, 90% answered positively. All these positive results from the public demonstrate that there is a possibility for the marketing of products using waste materials and that there are potentials for SMEs. However, when products using waste materials were on show in competition with other commercial products, reviewers became noticeably more critical. Audience feedback remained diametrically opposed with feedback such as 'it is still rubbish, isn't it?' (Tent London, 2012). The results highlighted that people liked the products using waste materials, not because of their perceived green credentials, but due to their cleverness, function, and beauty.

This study has reviewed some popular commercial products made using waste materials and presents these material aspects as an important factor in their products. Through their products, Elvis & Kresse have so far rescued over 170 tonnes of material, fire hoses, and other upcycled industrial materials and Freitag saves 640 tonnes of truck tarpaulins each year that would otherwise be destined for landfill.

Choosing unfamiliar materials in the traditional fashion industry has become an advantage for the brands and people are happy to purchase products even though they are made from pre-used materials. The material itself for these two makers has become a presentation of their brand identity and people do not consider that they are buying second-hand items, but fashionable new icons. These brands have a great paradigm of motivating people to dispel the prejudice of waste materials and re-use with a positive attitude. With its transformation through creative thinking, abandoned materials can still be loved again. Designing and making a product with a second-life that can be loved by consumers again seems a most effective way to reduce waste.

A common feature found from these two popular retailers is that there is no limitation to using waste materials to make a design repeatable, and another is to secure delivery, as making fashion accessories are usually smaller in comparison to home products. These are the significant point of the business using unwanted materials to be advanced in the market that can possibly be employed in the homeware sector.

PART 2. Practical Design: Small design business using waste materials (case studies) and a practical experiment using furniture waste, adapting the findings through research

Chapter 5. Waste material applications in small design businesses (case studies)

5.1 Introduction

This study has looked at successful businesses using waste materials for their commercial products, but in the clothing and accessories sector. This chapter investigates the furniture and products sector. However, designers or design studios who were contacted for participation in this research are of a smaller size (1–5 members in the group) and have quite recently entered business using waste materials or existing material for their designs, much like Adhocism (see Chapter 3) as this study is focused more on waste-involved design business start-ups.

Max McMurdo is a pioneer of reusing waste materials as his design studio was established in 2003, which is prior to many other designers in the similar sector, including participants in this study. Max became well known by appearing with his business idea of an online store *Reestore* with his own products using waste on BBC's Dragons' Den (2007), and secured an investment from the TV show. This designer has produced a few remarkable works, for instance, *Annie; shopping trolley chair* (Figure 31) *Max; bathtub sofa* (Figure 50) and *Silvana; wash drum coffee table* (Figure 51), but he is currently spending more time working as a TV presenter. On his website, Max describes himself as a upcycler:

> The online home of designer, upcycler, entrepreneur and TV presenter... Max McMurdo (Maxmcmurdo, 2017)

'Upcycling is the practice of taking something that is disposable and transforming it into something of greater use and value', which is not recycling and closer to the reuse of the surrounded existing pieces. From this point of view, this designer is a perfect candidate for the findings of this study, but this firm has now grown with him having his own team and working as TV presenter, the designer has not been selected for an interview.

Figure 50 – Bathtub sofa by Max McMurdo ©Reestore

Figure 51 – Silvana; wash drum coffee table by Max McMurdo ©Reestore

Initially, 10 young design groups were contacted by email and asked whether they would consider participating in a case study for this research between 2012 and 2016. In response to the emails, four of them replied and later in 2017 one more response was received. The remaining five that did not respond are not included in this research. The five designers are using not only furniture waste, but various type of waste materials, such as pallets, timber off-cuts, discarded or old furniture or coppiced branches. The interviews were taken with the author's own observations of their working environment and the development of works by the author's photographs.
The designers were chosen according to the previously mentioned criteria, but were also selected from a geographically diverse range of locations. All five designers were based within the South and Midlands of England to minimise transport costs and time for the case studies. They are from:

- London
- Wolverhampton
- Oxford
- High Wycombe
- Bristol

Appointments were made to meet with these five design groups in their workshops or studios, and photographs were taken, checked, and authorised. Each meeting lasted approximately one and a half hours. Although taking each case study separately, the interviews were carried out with similar questions including their history, background, philosophy and the difficulties in the setting up and running of their business. At the same time, observation of their works, studios, and workshops were conducted, which suggests beneficial directions to entrepreneurs who are considering using waste materials for their business. The questionnaires (see Appendix 3) for the case study are categorised into three sections:

- Business setting up and background;
- Design philosophy, process and current works; and
- Business running and its difficulties.

When the interviews were conducted, they were recorded on Notability, an iPad application, and transcribed later; photographs of their work and business premises were taken for each interview. Permission to use existing publicity photos from online media was granted to the author for some design groups. By their very nature, these businesses do not tend to hold historic or past works in stock and few archive pictures exist for some.

The interviewees are:

1. DZ design
2. Hendzel & Hunt
3. Furniture Magpies
4. Jay & Co
5. Geoffrey Fisher

Up to the end of 2017, all these five design firms were managed by one or two designers at present, and two design groups out of five were running with only one person, reduced from two members when the interview took place in 2013: Hendzel & Hunt and Furniture Magpies.

Each case study is described individually in numerical order, and the common and uncommon facts, threads, and opinions are discussed at the end of this chapter.

5.2 DZ design

> Being very waste conscious has led us into using every possible bit of our surplus materials in a more creative and productive way rather than sending it to landfill. This has grown over the years to us collecting old, redundant and unwanted pieces of furniture, taking them apart and re-using or re-working components to make unusual but modern pieces. This is an exciting process where design is based around available materials which helps add to the pieces' unique charm (Notonthehighstreet, 2017)

DZ design's workshop is located at Denton in Oxfordshire (to avoid the high rent and business rates in London) opened by a couple, Samantha Drewett and Richard Zakss (Figure 52). The business was formed in 2010 and the couple runs a small workshop producing a wide variety of craft-based products as a design partnership. This couple set up the business not necessarily with reusing old furniture in mind, but financial reasons to make the highest profit by making attractive furniture using their craft skills using leftover materials; they thought it would make their enterprise successful. However, they struggled in many ways at their first step out from the college: finding workshops, stepping into learning how to work on their own and self-discipline, finding clients and talking to them, setting the right price for products, and being confident (Zakss, 2013).

Figure 52 – Samantha Drewett and Richard Zakss from their website, DZdesign

Their first works were sourced with unwanted high-quality second-hand furniture as they were selling at a low price, but soon after they stepped into this sector, they could easily see reusable timber parts of furniture were thrown away everywhere and many pieces were burnt. So, they have expanded their material source into using more damaged and broken pieces that could not be sold in charity shops, and this became a regular supply. They ended up rescuing bits like legs and handles they could store and subsequently use in the workshop (Figure 53).

Figure 53 – Part of DZ design's workshop with furniture making machinery and shelving for material storage

Their first upcycling product, *Drawers Again* (Figure 54), which has been exhibited widely and gained a lot of attention from the public. Audiences are inspired by the couple's furniture and ask if any individual pieces of furniture could be improved and modified like *Drawers Again*. Buyers they have met at shows have commented positively upon their ideology and process. They believe that people purchase from them because they are amazed to see how these designers have turned junk into something special. It evokes nostalgia from people's childhoods, as the works have a retro/vintage feel, from their transformation of kitsch or dated objects, normally thrown away. This design group are positive about the fact that products using waste materials, such as their work, can have a positive influence on general perception.

Figure 54 – Drawers Again – the drawers and legs come from various bits of old redundant or broken furniture that would have otherwise ended up in landfill.

DZ tries to think how and what they could design to reduce energy and material use and yield less waste, while processing their work. When customers ask them to try something new, they aim to use most types of components from what they have currently in storage and use only locally sourced alternatives to maintain methods that were as kind as possible to the environment. The materials they have obtained are not completely dismantled for storing if they are still in good order and functional for reuse, so retain their original beauty.

> It just evolved from us. Our ideas weren't to make recycled stuff... And then we had time on our hands and things to play with. And started making a few bits and pieces and thought it was actually quite nice because our lifestyle here is sort of recycling everything and live to a minimum (Zakss, 2013)

As most of their design concepts involve working with materials from objects that are twisted or not straight, or having to add things, the products cannot be always repeated, are not allowed mistakes, and offer a creative challenge to use all the different components within their furniture. The most important thing for their products is that things must look beautiful with millimetre perfect gluing up (Figure 55) and a full polish. Their making process is, thus, a highly time-consuming process to meet satisfaction and sell for an acceptable price. For example, *Drawers Again (*Figure 54*),* consists of a made carcass around the drawers, not the other way around and they consistently try to create things that are well-crafted and maintain a balance between each other.

Figure 55 – Mitred Ply Box Tea Light Holder, made of plywood from an old G-Plan sewing cabinet. The boxes have been mitred together at the corners to go with the flow of the ply.

Like other businesses, the most important thing to achieve for them is making a profit. Before opening their own company DZ design, they realised that having a workshop and 'making nice things' (Zakss, 2013) is not the way grow a business. Working on getting actual commissions is essential and is the hardest part, so, obtaining a second job at the beginning was unavoidable. Both agreed that the fundamental problem for running a small business is getting enough clients. To do this, marketing is indispensable although it incurs high costs. Most of their customers are individuals rather than retailers, thus, they try to find the best way to advertise via social networking services (SNS) as a solution because of its low cost with no limitation on location. What they have learned is to keep updating SNS to increase their exposure to buyers. Moreover, presenting works through exhibitions is the most efficient way to be acknowledged and getting valuable responses from everyone they talk to is an advantage of such exhibitions, although designers have to find the right exhibition to go to before they decide. A combination of these two marketing methods have been a cost-effective method.

However, to promote their products, they attempt to avoid the word 'recycling or upcycling' as it can get generate a negative image. They believe 'upcycling' is probably perceived by the public as a painted piece of second-hand furniture and 'recycling' reminds them of rubbish. Thus, they have said those expressions would not work with the high crafted furniture that is articulated in a seemingly more sophisticated way. DZ explain to people that they use locally sourced English timber from local sawmills and use off-cuts instead of unwanted or discarded materials.

In 2012, the main selling outlet moved to 'Not on the High Street', one of many other online markets, from selling to individuals through craft shows, together with some magazines. Their most reliable selling route has been the tradition media, on which buyers are already informed about the designers and their work from their articles. Online retailing can be difficult as it cannot show the individuality of an actual product. However, differences of opinion, which, when two people are working together is inevitable, lead to discussion, and upon agreement, lead to arguably better quality products. This exchange has led to an altered design range containing smaller products such as their pebbles (Figure 56) made from oak timbers inspired from

another work '*Split Oak Ring Table'* (Figure 57). The coffee table was made from a piece of reclaimed wood and it has evolved into a big oak pebble, then to tiny oak pebbles. So, they redirected the influence on smaller, affordable wooden products. They affirmed that this was a quite progression for their business as these sorts of small items sell consistently well through online shops.

Figure 56 – One Oak Pebble, worked from the offcuts from previous work, such as the Oak Ring Table, these are an ad hoc extension of the product line.

Figure 57 – Split Oak Ring Table, a use of wood that may have otherwise been burnt. The way in which the branch was cut meant that there was a natural split in the wood, which has been emphasised by using stainless steel inserts to securely join it back together.

The business has been running for about six years, and they believe they are still evolving, learning, and growing. They never received any start-up business funds, but they recommended if anyone starts a business there are many places for financial support, which would be helpful for start-ups. These need to be considered in a timely manner as they require a large time commitment, but could provide an opportunity to estimate business running costs with a realistic and fully costed business plan. They found out that even with their business experience, they are still not accounting for all relevant expenses. Time spent on making processes, organising, cleaning, fixing and paperwork are often not accounted for until entrepreneurs get into the real business. *Drawers Again* is their favourite piece, because it is the most popular; however, they think they will never do similar things again. They have changed their design process

to similar methods for their products, so they can be repeatable and increase production for better sales. DZ design has been growing little by little, but they do not intend to expand as it would take their time away from making, which is their favourite part of their work. They are also concerned that if something in the business went wrong, once they increased in size, employees would be laid off. Their advice to designers who would like to set up their own business is as follows (Drewett and Zakss, 2013):

> Samantha: if you keep things small and manageable, and go with what you can afford, then there are plenty of affordable ways.
> Richard: If you are starting up, it is best to start up with people around you … with other workshops so that you can mingle and meet and talk to people and you might get different advice from people; that makes things interesting.

They also suggest that talking to someone about whatever concerns and working with someone else is useful and helpful for improving their work in many ways.
DZ design is a viable design business that works in this challenging business environment because they enjoy what they do. They know what they want to make and are not getting tied into other jobs that they do not believe in or cannot handle. They have a strong sense of what they want to do and how they want to balance their work and their lives, and this is a key part of their ongoing success. As of 2017, they continue to run their business under the same name, but remain less active. Their business is not going as they predicted; this could be because their products have not been updated regularly and there has been no further promotion through SNS or exhibitions.

5.3 Hendzel & Hunt

An interview was arranged with Jan Hendzel and Oscar Hunt at the Hendzel & Hunt Studio (Figure 58 and Figure 59), Peckham in London on 18th June 2013. This group's experience is a most helpful example for presenting an idea for start-ups, as their plant remains well-organised for making and designing jobs, and their exceptional promotion method has been planned through interactive projects with other designers and the public. One of the projects is the *24hr Challenge* (Figure 60), which they launched in 2011 and is now running annually, as Hendzel & Hunt explain:

> The *24hr Challenge*, which has been devised as a platform from which to encourage discourse and experimentation, through the narrative of a design and make exercise, on the processes of sustainability, up-cycling, and localism.
> Hendzel and Hunt's studio-workshop will be transformed into a platform for discussion and experimentation on which both the up-cycling of materials and the interpretation of their origin will be essential to the approach (Designersblock, 2017)

This duo called for entries to this activity and shared their space with four other working teams. The *24hr Challenge* was also filmed and edited into a short documentary by BAFTA (British Academy of Film and Television Arts) and was nominated for the short film director with the participants, working processes, and final outcomes of the event. This film was premiered alongside the objects at Clerkenwell Design Week from 24th–26th May 2011. After seeing the short documentary film on YouTube,[31] it became clear that Jan and Oscar are an example of good practice for young designers, who are considering setting up their studios, as their strategy for establishing their business is popular and receives positive media attention.

Figure 58 – Jan Hendzel and Oscar Hunt in their workshop, London design magazine, 2014

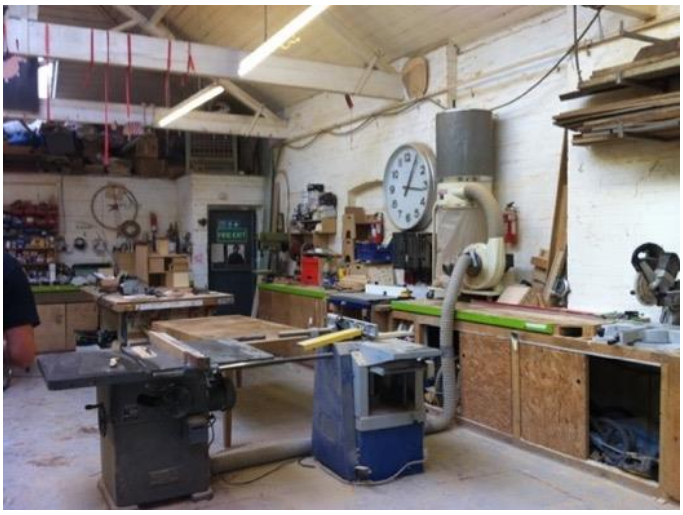

Figure 59 – Hendzel & Hunt studio, Peckham in London on 18th June 2013.

[31] Upload a video of (someone or something) to the video-sharing website YouTube, Oxford dictionary, 2018

Figure 60 – The outcomes of the 24hr challenge project in 2011, which gathered designers and asked them to create a machine capable of playing an Edison Bells record in one day. Only materials sourced from the surrounding area are used, and the designers are not allowed to step anywhere near digital technology.

Initially, questions focused on whether this group's environmentally friendly approach to business was a result of research that they had conducted. Also, their decision regarding on-site location was queried, as the priority ethos of their design is localism (Figure 61). They explain that opening the business in Peckham, and using reclaimed material from that district, is lucky for them. As a team, Hendzel & Hunt notice that they effectively find solutions and can quickly resolve mistakes. Both worked as cabinet makers in London, where their employer allowed them to use his facilities until they decided to move out of London.

Considering most of their clients were in London, they only kept London in mind for relocation. In financing the rent for their workshop, they contributed their entire savings from their first job and a loan from friends and family.

Figure 61 – Hinckley Table by Hendzel & Hunt for the Made In Peckham range. Made from disposed waste material collected in and around their own neighbourhood of South London

Soon after, their business gradually grew organically without a strict plan of activities. However, with a shortfall in finances, the only option available was sourcing materials from objects they encountered from their immediate surroundings, rescuing goods such as pallets destined for landfill.

The challenging part of designing and making using disposed objects involved an enormous amount of time, and this costing on hours must be reflected to make a profit. Jan says,

> Our stuff is expensive because the materials are tricky to find. We have to completely clean the material like contaminants of metal and even so, it goes through the machine and you miss one bit, bang the blade is gone. It's this extra time that adds quite a big cost to the project (Hendzel, 2013)

This design duo believes that clients who love their work are buying into the idea of transformation, craftsmanship, and the appreciation of the material. However, if goods are made of pre-used components, buyers often expect a lower value than the marked price. They are sometimes told that they need to make affordable range products that are accessible to many people or retailers. Nevertheless, they never produce inexpensive goods through mass production as even small works take a long time and it is not possible to wait for profit returning over a longer period, in comparison with selling commissioned pieces.

The company has developed a niche market by targeting clients with a bespoke design and craft service using the uniqueness of waste materials. Most of their customer base developed via word of mouth, and their presence increased through design shows, their website, and social media. Occasionally, retailers have approached them to stock their products, but they determine the commercial market by targeting their niche audience. For example, a fashion boutique, 'The Shop at Bluebird' in London sells luxurious designer brand clothing stocks, some of the Made in Peckham series (Figure 62). Customers from the shop appreciate the design and how it is made, and are thus inclined to pay for chairs at £650. They say it is a rare for retailers to support their work and prefer to work with individual customers. Still, the problem with having individual clients is that people tend not to understand that the finished product can be unparalleled to previous outcomes because they are creating one-off articles.

Figure 62 – The Kirkwood Chair, made from reclaimed hardwood and Victorian floorboards; and the Hinckley Table, which is similarly made and rests on a foot of six interlocked pieces of wood at The Shop at Bluebird in London, UK.

Although certain product designs use a same formula, the found materials bring about a variable appearance, and public thinks the products are different one. Thus, Hendzel & Hunt ensure time is spent with buyers, and all discourse is agreed on paper with a signature before the work commences. Designing and producing products re-using discarded materials is complicated, as sometimes these upcycled goods restrict the possibility of identical duplication.

Hendzel & Hunt dislike the word Upcycling, and state that 'it is a funny word'. This term was not familiar when they set up the business in 2010, and it seems it has been more commonplace ever since. When they try to explain their practice, the term upcycling has recently become fashionable, and Hendzel & Hunt think that is exactly what they are doing, so have used it. However, it is not enough to define their philosophy and the term 'upcycling' has merged with the word 'craftsmanship' as it tends to suit their strategy for business. There are several websites on which Hendzel & Hunt introduced their creations under the term upcycling, and articles have often been presented in their project *24hr Challenge* (Figure 60) since 2010. They have established their brand value through this project, in which upcycling, together with craftsmanship, can be regarded as an astute gesture that can be adapted for new starters.

An article at online magazine Despoke:

> Hendzel and Hunt, showing not only a great skill in furniture making but an uncanny understanding of Marketing as well. All the furniture is designed and built with sustainability in mind (Despoke, 2011).
>
> The *24hr Challenge* is an intensive task to complete as it takes a lot of organisation, preparation, application; they are not planning the event any time soon.
>
> It's kind of good for publicity I think but you don't find clients there, you don't find people like wanting to buy your work or you don't get any sales or jobs so much from it (Hendzel, 2013).

However, Jan insisted that advertising the brand and business alongside the event is an important part of the enterprise. As soon as they found out that their brand name Hendzel & Hunt was recognised, they moved onto increasing sales via trade shows instead of design festivals.

At the date of interview (18.06.2013), they had enough existing orders on the production line, but not sufficient profit due to shortage of space and time. Their biggest problem is the negative cash flow they have to manage. One of the interviewees says 'We learn, you can never say no because we have a small business. So, you have to say okay I can do that'. After accepting every single job that come through, they have to employ a few people to accomplish and it results in gaining less acquisition than expected.

From experience, they recognise the balance between overloaded responsibilities and time management is the solution for rising profit. While operating on physical part of business, a company's liquid assets are hardly visible, and it is only discovered through the accounting at the end of month or year. Thus, it is ineluctable to identify the current problem of the company although the fact is severe and the vision for the future needs to be suggested at the same time to make the company stronger.

Many of their works do not use screws, nuts or bolts, but are joined via woodworking techniques, which demand time (Figure 63). With all aspects, people who have been served by these men always give positive feedback about their work and service. This is perhaps one of the many reasons they have firmly established their brand. Naturally, the working hours must be rewarded by clients, and if people consider the products to be expensive, they say the products are in the right market and reconsideration is needed.

Figure 63 – Instead of commercially available joining methods, the Fenwick Ladder has been made by utilising a series of handmade wooden nuts and bolts

As mentioned earlier, this duo is skilled in advertising their brand name and the *24hr Challenge* project brought them another excellent opportunity via workshops at The Victoria & Albert Museum in the summer of 2011. It was one of the V&A's free Summer Camps (Figure 64) during which the public can explore the design process with established designers; Hendzel & Hunt were the invited designers.

Figure 64 – V&A's Friday Late Summer Camp: explore the design process in three stages; 'Idea' (July 29), 'Design' (August 26–27) and 'Make' (September 30). The reclaimed pallet and wooden bolts and nuts were used by members of the public to make giant letters.

They have created a guide for the public to build using reclaimed timber, mainly pallets, but using nuts and bolts, which contrasts their usual making ethos. However, the duo believe that using familiar objects, bolts and nuts can make the activity more

enjoyable for people as they are easy to handle. Through the event, they are convinced that their brand Hendzel & Hunt became stronger and they much appreciated the chance to interact with the public.
The team were asked if they believe that children of a younger age are more appreciative of things that are made from discarded objects to create brand new products, through the exposure to this type of interactive reuse of waste (Hendzel and Hunt, 2013). They both believe that running regular workshops like this for youngsters could be very beneficial in the long term:

> Oscar: I think people do appreciate it more when they actually see it and play with it themselves … Because until that point it's just an object, isn't it? It's just something you look at and if people actually get to play with it, they discover more.
> Jan: When children are young, they are just having fun so I guess they're not really taking up the idea of like, this is kind of the future here. But then … children I guess, they're going to be more in tune, from a younger age, they'll pick up on it more.

Despite numerous, unpredictable problems in running their own business, Hendzel & Hunt's advice for new start-ups working in a creative environment, is to be confident in yourself and your ability, enjoy experimenting with your media, and not to give up. They have suggested that operating a business as a team is advantageous, as an extra person is always helpful; and be prudent of negative cash flow, which could easily effect the success of a small business. As mentioned earlier in this case study, the most impressive part of Hendzel & Hunt's business is their creative marketing strategies, for example, Made in Peckham, because the name of the location has been previously famed for its negative impression and whether it is good or bad, they know this can easily be remembered by the public:

> We marketed quite strong on Made in Peckham. Peckham is a place, is like, kind of famous but for the wrong reasons, plus now, everyone wants to come to Peckham; it's a party place … a trendy place. So, we kind of like tongue in cheek. And the name of it, anyway, Made in Peckham (Hendzel and Hunt, 2013)

They not only concentrate on their brand image, but also attempt to attain production perfection. Buyers identify with their imaginative outcomes, which were developed utilising the natural colour and texture of rescued materials within the limited timeline. Their financial success is due to their time-management, and the efficient balance between labour and price, which keeps their business secure in the sustainable design market.
In 2017, Jan Hendzel is running his own studio (Jan Hendzel Studio) after he relocated to Woolwich from Peckham in July 2015. The pair are not a duo anymore, but Jan carried on the business from the Handzel & Hunt philosophy: the importance of sustainability in a woodworking practice. The business seems to be growing through his recent work, which is comprised of a range of wooden furnishings for a pop-up cafe at Camberwell College of Arts, forming part of the £62 million

redevelopment of the southeast London campus. Also, he recently presented his latest beautifully handcrafted work in Design Junction, September 2017. Although the business has changed its form, it can still positively influence design start-ups.

5.4 Furniture Magpies

Furniture Magpies was set up in 2010 as a part of a fellowship programme at Bucks New University in High Wycombe. Sua Lee, the author of this study, together with Nessa Doran O'Reilly and Sivan Metzer, started this business after studying for their master's degrees in Furniture Design & Technology at Bucks New University. The author was part of this group until December 2013, and the experiences and creative outputs during this period have informed the practical outputs of this research study as indicated in Chapter 1.

In 7th March 2017, when this interview was held, only Nessa Doran O'Reilly was running this enterprise in Bristol.

Furniture Magpies struggled to watch the vast quantity of beautifully crafted and constructed furniture going to landfill each year, and decided to offer alternatives to mass-produced furniture using unwanted furniture and its parts (Figure 65). However, every step of the working process has taken double the time because of limited access to workshops and storage; this has diminished the company's finances.

> We don't believe in good furniture going to landfill when it can be redesigned into a piece that people can love all over again (Furniture Magpies, 2017)

High Wycombe is ideal for their business as the place is familiar through their study, and the necessary furniture associated infrastructure already exists at the university and in the surrounding town. The environment of the town is especially important as it is steeped in furniture history and an enormous amount of beautiful, well-constructed, locally produced furniture, such as that made by Ercol and Gomme was being disposed of or becoming unwanted due to damage or perceived dated aesthetics.

Figure 65 – Stocks of unwanted furniture components saved by Furniture Magpies

When the company first started it was difficult to know whether Furniture Magpies would have a market for what was being created, even if they were all convinced of how high the awareness and growth of the green or eco market was at that time. Nonetheless, they had discovered no other companies doing similar work. Source pieces for the works were readily available and inspired many end designs, which would honour their history while being functional, beautiful, and clever by transforming parts of discarded furniture into alternative products. Hence, the company hoped that their pieces would offer something a bit different to the widely available and expected recycled produce.

In contrast to Jay & Co, one of the case study conducted in this study (see chapter 5.4), Furniture Magpies believes that they perfectly encapsulate 'upcycling'. Their goal is to take a piece that is no longer wanted or useful in its current state and elevating it to a piece that would be considered desirable again through attractive design.
Nessa acknowledges some negative feedbacks by the public and designers on upcycling being seen as unfashionable in the industry at present, because it is received as an unwanted item painted or reformed, which could be done by anyone conceived as an amateur or through a DIY-associated design strategy.
Yet, escalating the original definition of the word (see chapter 5), would possibly encourage a view related to the value of the waste. Instead of using newly recycled sheet-type raw material, so it can be easily transformed into an object like Smile Plastics' *Recycled Washing-up Bottle Chair* (Figure 66), Furniture Magpies adopts the original shape form of the waste material, which remains integral to the object as a strategy. Whether promoting their consideration of green issues would help them to grow or not is unclear, but Furniture Magpies never market how environmentally friendly their works are. Instead, they mostly stress good design and functionality and believe that aspects of sustainability are a more personal requirement.

Figure 66 – Aaron Moore, Reform Furniture Bottle Chair, made using Smile plastics (recycled from shampoo and detergent bottles), on solid wood frames © eco design

Furniture Magpies sources materials from various places such as house clearances and charity shops and often receives donations of unwanted or damaged items. Identifying 'beauty' within previously designed products, the group regenerate old furniture to meet the desires of modern day consumers.

Their re-assemblage with, often, completely changed functions, preserves part of the story and energy of the original materials, which have a new appeal to people. They use the quirks and character from a range of media, and embrace this to inspire the final design.

> Our designs are a little bit like a recipe; we always use the same ingredients, but each piece comes out a little different every time depending on what we have available. This means that each piece is unique, which is a big selling point to our buyers, they get to take home something that no one else has (Metzer, 2011)

For example, their *Lovely legs table lamp* (Figure 67) and *Fido* (Figure 68) explain exactly what the design ethos of this company is.

Lovely legs table lamp is constructed from the re-assembly of existing parts of an old chair. The extent of craftsmanship and embodied energy involved in the manufacture of the traditional Windsor chair – wood-turned legs, jointing, and finishing suddenly becomes overlooked as the object falls out of fashion, and subsequently discarded.

Thus, its component parts have been refashioned to make a small lamp that retains its original character and life, but with a new function. *Fido* is multi-functional – a reading light, occasional table, seating perch, remote control/ book minder that looks animated and friendly due to its angle-poised head and it is neat and compact. Dictated by the sum of its original parts, the side view of timber dining chairs resembles the form of a dog. Furniture Magpies are confident that customers would be drawn to the nostalgia and associated histories of these pieces, alongside their practical function and playful edge.

Figure 67 – Lovely Legs table lamp made with Windsor chair legs and second-hand lampshade frame by Furniture Magpies, 2010

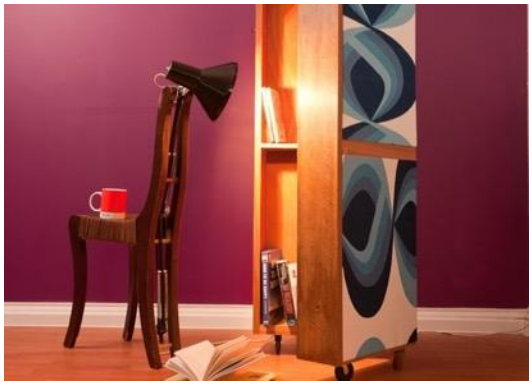

Figure 68 – Fido by Furniture Magpies made with broken angle-poised lamp, dining chair, and leather offcuts, 2011

Initially Furniture Magpies fulfilled orders for prominent retailers such as Selfridges in London (Figure 69) and Anthropology in the USA, and also featured in numerous magazines such as *Living* and *BBC Home & Antiques* (Figure 70). All these orders were made through the exhibition, Tent in London, which they attended in 2010.

Figure 69 – Lovely Legs table lamps on the underground floor at Selfridges in London, 2010

H&A PEOPLE

VIP. Furniture Magpies

These three ladies have an eye for a find

Meet Sua Lee, Nessa Doran O'Reilly and Sivan Metzer, also known as the Furniture Magpies. The three friends – who met while studying furniture design technology at Buckinghamshire New University – scour High Wycombe for broken chairs and chests of drawers and upcycle them into quirky, one-off pieces for the modern home. 'It's better to reuse than recycle,' says Sua. 'If something can't be restored we find a new life for it.' Windsor chairs are turned into lamp bases and clocks; 1970s curtains are used for upholstery; and drawers from old chests are transformed into intriguing coffee tables.

Showing off the craftsmanship that went into the original pieces is important too – 'It's all part of the story,' says Nessa – so they try to highlight features such as dovetailing and the wood grain in their work. They particularly love how animal-like the various pieces often appear and even refer to them as dogs and spiders. 'They all look as if they're going to come alive and run away,' laughs Nessa.

NEED TO KNOW... WHO'S BUYING? Anyone with an eye for the unusual who wants to make a statement
H&A'S PICK The 'Fido' reading lamp made of chair legs and a broken Anglepoise, which even has a pouch in its belly for your unsightly remote controls **CONTACT** 07538 002160; furnituremagpies.com

MARCH 2012 H&A 19

Figure 70 – Feature of Furniture Magpies at BBC Home & Antiques, February 2013

As the company has become more widely recognised by the press and retailers, exhibitions have become one of their primary marketing tools. Their new products are presented every year at the London Design Festival and were exhibited in Milan in 2010 during their first year of launching the company, funded by the programme, and with support from Bucks New University. From the start, they all knew the marketing is a big part of the business and as such, Furniture Magpies has used social networks and built a web page, from which it has gained further stockists such as *British by Design*, *Moorbi.com*, *Cavaliero Finn*, *From* in Thame, and *Not On The High Street*.
The company was rewarding and seemed to be working perfectly until it started to realise that it was not making enough profit and unbalanced expenses from the company's pocket has become an issue. Cash flow has been a problem; in spite of many of the materials being free, each piece is incredibly labour intensive, requiring much hand finishing. Also, as always when designing and making from found objects, a shortage of certain materials causes trouble and delays. When all three members worked within the firm, the majority of Furniture Magpies' sales were made through online markets, such as *Not On The High Street*, *Etsy*, and its own website. However, it soon discovered the strains of the business with unpredicted work, for example, involving taking good quality photographs of products, customer-service time with clients, time required to update the website, packing, finishing, posting and delivery. On account of all the hard work, the return was insufficient for financial support and members had to take second jobs, which affected commercial activities and the entire business.
As a consequence, two members have left the company after four years of trading and changing the company is a natural progression. Now, the business has evolved from supplying targeted retailers and individuals with commissioned pieces, to operating in an educational capacity and presenting on television, whilst still creating bespoke work for clients. With an expanding business sector, the company's profit has increased enough to cover one person, and in 2017, remains in positive progress. When O'Reilly replies to the question about the primary concern of carrying on with the company currently;

> Money is often the problem, making such labour-intensive pieces and wanting your work to be affordable to all just cannot work (O'Reilly, 2017)

To survive and grow out of a struggling business, she believes that inventive marketing is key to increasing sales and keeping the business going: 'I have been told that to be successful you have to spend 30% of your time in the workshop and the rest marketing!!' Furniture Magpies' marketing was mostly carried out at trade fairs or markets up until the TV work. Currently, O'Reilly is working with Channel 4 on two upcycling programmes, *Fill your House for Free* (Figure 71) and Phil Spencer's, *Perfect Home*. O'Reilly's television show won the RTS (Royal Television Society) Scotland Awards, and she has now become a TV presenter with a managing agent. Working with TV shows brings her a regular salary, and it also helps to promote her teaching courses at West Dean college, so it has grown into an effective marketing tool for the business. She recommends that design SMEs need to use social media more effectively to get their profile recognised. Also, O'Reilly comments that design festivals or craft markets, if affordable, are a good way to gain recognition and

feedback from the public, but not to look directly for or expect retailers as there is rarely a direct link to sales.

Figure 71 – O'Reilly talking about her work on Channel 4: Gok's Fill Your House for Free (18, July, 2018)

Reviews on Furniture Magpies' work via social networking, customers, buyers, and audiences are positive, and these have encouraged the company to continue what is doing. People do not initially realise the pieces are made with waste materials but once the story behind the products is explained, this adds to their appreciation.
Furniture Magpies has become more about the education and training of others in upcycling and O'Reilly would love to continue this route in the future and aims to make and design products, but more as an exemplar for others to follow. O'Reilly would not say if she thought that the business was successful yet, but the company is getting nearer to the goal and insists perseverance is the way to reach this.

> I had to work at many other jobs at the same time to keep money coming in so that I could pursue my passion, which leads to the most important bit – I love what I do, and I happily sacrifice a lot to keep doing it (O'Reilly, 2017)!

From her experience of running a business as a self-employed designer, seller, maker, bookkeeper, marketing person, packing and posting man, educator and TV panellist, O'Reilly has learned there are many things she would reconsider to gain more profit, but being flexible and adaptable should not conflict with your design ethos. What has helped this business to increase returns is that it has expanded its product lines in smaller sizes, using off-cuts from raw materials instead only using waste furniture parts for the materials, and developed its own packaging design (Figure 72), together with a sister brand, Sam Agus[32] Nessa, to duplicate products more easily.

[32] Irish, meaning "and" in English

Figure 72 – Personalised packaging for newly produced product under brand Sam Agus Nessa, 2017

All new businesses need help with correct information that is specific to the individual business type. Furniture Magpies suggests that there are great communities for creative people looking for help. For example, there are open-bench workshops during which designers can rent a work bench or a space with a counter for a day, month, or year with access to all machinery and tools. Many small businesses are working under the same roof helping each other out, and that would be the supportive place one might consider at the start.

5.5 Jay & Co.

Jay Blades is a furniture designer who revamps second-hand furniture to be more attractive and marketable with paint effects and re-upholstery. He is one of the most popular TV celebrity designers and has featured in several television programmes such as the BBC's *Money for Nothing*, ITV's *This Morning Show*, and Channel 4's *Fill Your House for Free*.

His background is considerably different to the other case study designers as he studied a BSc in Criminology and Philosophy at university and was interested in finding ideal youth projects while volunteering for various youth organisations and social enterprises in High Wycombe. A charity called Street Dreams was the result and one of the activities from Street Dreams led him to the furniture industry. Besides aiding local youngsters, the project *Out of the Dark*,[33] supports and develops Blades' commercial expertise within the project and his development as a designer maker.

> You're paying for sustainable products, and its sustainable products that come with a sustainable business, which is a social enterprise that teaches young people, and all that money gets ploughed back into the charity. So the price... Yes, the price is not a problem (Blades, 2016)

[33] A charitable social enterprise that recycles, restores and revamps salvaged furniture as a means to train, educate and employ young people from disadvantaged backgrounds, Interview: Jade Blade of Out of the dark, 28 March 2014, The Design Spread.

This is how Blades has become well known to the public; he established his own company Jay & Co. a few years after as his social enterprise folded. Jay & Co. is set up in Wolverhampton (Figure 73) to continue his mission and acknowledge his growing business experience. A great deal of support was necessary for the launch of Jay & Co, and the methods in which he managed to fund the business could well inspire many others to seek help with business start-ups. One of the major reasons for his relocation is that the workshop in which he now operates is donated by a sponsor who supports his social work, which has significantly contributed to the finances for the business.

Figure 73 – Jay & Co.'s workshop in Wolverhampton, 2016

The TV programmes in which he participates have helped to define his work as an upcycling business, and have shown examples of his work, revamped from old pieces of furniture. However, Blades dislikes being called an upcycler, because he believes that the word is more of a trend and there is no professional sense attached to it. The term itself he feels lessens his craftsmanship skills, so he prefers to be called a modern restorer.

> For me, the reason why I don't call myself an up-cycler is because the people who have trained me. I've been trained by master craftsmen and women, and if I was to call myself an up-cycler, I would be belittling what they've taught me (Blades, 2016)

Blades believes that environmental terms are often used for a business marketing tools to convince buyers that they are doing a morally right thing, but Blades himself does not focus on sustainable issues, rather on the work itself. Thus, his main competition is the new products on the market, not environmentally friendly objects, so Blades always emphasises the design element of his work. His primary element of design is showing the previous life of the object by boosting it with a new touch: 'my designs are about paying homage to the life the chair has lived before' (Blades, 2016). His works appeal to clients who want original, unique, and customised pieces and are content to pay the asking prices for his original designs. Blades concludes that it is

because people understand that what they are spending is for a part of English history and English design movement. He says, 'You only stand out for your designs, and my design is very original to me'. He has no doubts that his designs can reach prices of famous designers and stores such as *Conran* or *ARAM*, and he sets the price based on that.

Blades defines his design work as experimental, courageous, and bold, and he believes this is the reason his works are loved by the public. He likes playing with colours in unexpected places on the furniture. Its fresh look is something extraordinary but well harmonised with all the elements and forms (Figure 74).

Figure 74 – Chair with one leg painted and unusual deep buttoning position, 2016

Despite the fact that his objects are popular, he says running his own business is not easy. As his main design element is painting and paint effects, he is aware that his objects are easily compared to many other examples of painted furniture (Figure 74), but he believes that he has stood out from them with his quirky design. Blades says that maintaining originality and creativity of design is what makes his business unique.

Figure 75 – Spindle Back Valley Dining Chair – Painted in grey or white like many other painted second-hand chairs in the market by Homebarn in Marlow, Berkshire ©Homebarn

Blades insists the most difficult thing for him, in addition to financial matters, is staying on top of the market. Because there is no assistant for his business, every single job is his responsibility, including such as dealing with marketing, designs, accounting, and business. This is the biggest challenge he faces now and it requires constant planning and forward thinking to achieve.

Blades spends 90% of his time on marketing as he believes that marketing is all about understanding what your brand is, who your customers are, how you are going to engage with those customers, and what those customers are into (Blades, 2016). His marketing method is mainly via social media as it is ideal for him to communicate images of his work, and this is why he can secure the copyright automatically and without cost, which is good for an SME with a tight budget.

Social networks are like a shop on the high street, hence winning photographs and strong imagery are essential for success.[34] Online pictures are an interactive avenue for customers for whom the tactile feeling is only possible in the shop. 'They're buying it simply from looking at an image that I've taken'. All the photos on the company website and social sites are made by himself using his mobile phone to show the product in context and to sell the concept, not just the product, thus people can imagine how the product will match their lifestyle (Figure 76).

Figure 76 – During the interview, the designer explained how the background and location of a photo can change the image of the product,. 2016.

As a result of Jay & Co.'s products being unique, one-off pieces which cannot be duplicated, continually showing pictures or words by uploading newly completed pieces, and his 'thought of the day' or snippets of his working progress are all a significant part of interacting with the public (Figure 77).

[34] The core problem of shooting is choosing a suitable background, and contrasting colours between the backdrop and the products can work well Besides the main shot other supplementary images explain as much as possible with three-dimensional perspective views showing top, bottom, front, back, right side and left side views. Jay Blades, interview with author, Wolverhampton, West Midlands, 14.07.2016

This way, he establishes a strong brand identity, which leads him to increased sales; he also features in the media and hopefully, in the course of the time, will become more successful in his business as a designer. He attends exhibitions, but only when he is offered free space, as it costs too much and the sales through exhibitions never cover the cost of setting up, time, and transport costs. Blades says that this type of marketing is not suggested for SMEs who have just started with a tight budget. Before talking about marketing for small businesses, adequate products must come first. Without a thing or a service, there is nothing to promote.

Figure 77 – Jay & Co.'s Facebook timeline on 21.07.2017 showing his method using of social media to constantly ask about his works to communicate with, and seek feedback from, his large number of followers

The feedback from the customers of his creations are defined dynamically, such as 'young urban type', or 'his magic', and he says that it encourages him to keep going with what he is doing. For this company, not only finished pieces, but also, the unfinished products still in production are used as marketing tools via social media. Showing his vulnerability in relation to his works achieves more attention by the public and he associates this with positive feedback. 'It's getting those people to buy into the brand, people to feel part of the brand and understand like, oh, he's being honest' (Blades, 2016). Customers are like audiences, and they crave to see the whole story about the products and the person behind them.

To express his unique colour palette, he is always careful to balance second-hand materials and freshly purchased materials when developing his design. The significant task for most projects is choosing the right materials, and this can be only finalised by buying and mixing up new finishes with the obvious unavoidable

expenditure involved. This requires careful consideration regarding whether the materials could be multiplied on other activities or projects or cooperation or collaboration with other designers without compromising the design. For instance, some of his products are named after someone by whom he has been inspired or admires, and he showed his favourite work *Jay the chair* (Figure 78), which he named after himself, as he believes everything on that chair is beautiful. The chair represents a model of best practice for his business. He takes customers' preferences to obtain their individualism, but until he is satisfied with the work, it cannot be on the shop floor.

Figure 78 – Jay the Chair demonstrates elements of his colour palette and design philosophy, with dominant colour matching missing out one coloured leg, odd button positioning and halved upholstery piping, 2016

All the main work is carried out by himself, but he does not prefer to work alone and invites people to assist if possible, to gather fresh ideas from different backgrounds and personalities. He has now merged this business concept to evolve the business to a more commercial footing, but has also expanded into the educational sector, offering a training programme for young people in vulnerable positions, to take positive action in their lives.

Jay Blades surmises that his business is on the right track, and it works due to his unique approach to vivid colours, his reputation of persevering with assignments, and his obvious enjoyment with what he is doing. His previous social enterprise with young people has led to the development of his trademark style (Figure 79), such as, using one dominant colour in contrast to another part of the object; the unexpected deep button placing or mixed colour piping. When working with young groups, their experimental colour matching, and combination of fabrics on the shortage of materials, gained positive reviews from the public, and his works has become more like playing with what is in stock.

Figure 79 – Black and Lime Green Ben Chair Black velvet and Lime Green velvet piping (all bought from local markets), using contrasting colour matching and divided piping colour with corner buttoning

From playing with bold colours and mixing up fabrics he developed his design ethos and fell in love with. Not only his approach to colour placement and techniques but also his masterful skills such as painting techniques, restoration, and upholstery of furniture have ensured he is respected in the industry.
When this designer asked for advice for entrepreneurs who would like to be self-employed designers, he said:

> The first thing they should think about is whether they're physically and mentally strong enough to actually do it, then you can handle it, because it will test you. So, you have to be prepared to do... To do everything, first and foremost. If you're not physically and mentally ready, don't start your own business. Sit down' (Blades, 2016)

He informs that finding the right target and right approach to marketing will help to build a business. For example, trade shows or exhibitions are appropriate for well-established contract furniture companies, as they require significant money for stands and regular attendance for at least a couple of years. Whereas for some young entrepreneurs, there are many different ways they can sell their products in a small budget, such as bloggers who are relevant in a similar field, telling their story about the design through social networks, or directly contacting high street retailers or interior designers. Blades also mentions that small businesses are sometimes confronted with complications with bigger companies copying their ideas without permission, but by promoting unparalleled design with unique character and originality, with work in progress in the media, this can be made less prevalent.

5.6 Geoffrey Fisher

Geoffrey Fisher has got many stockists around the world, including the *Conran Shop*, *John Lewis*, *The New Craftsmen*, *and Urban Outfitters,* and he thinks his work is selling because it is different to others in the current market.

This interview with Geoffrey Fisher took place on 14th June 2017 in his workshop (Figure 80) next door to where he lives in East High Wycombe (Buckinghamshire). This is an excellent location for the firm as it is close to the woods from which he collects most of his materials and has easy connections with London, where most of his customers are.

Figure 80 – Geoffrey Fisher's design studio in High Wycombe, by the writer 14.06.2017

Fischer started his business in 2011; his previous profession in fine art and sculpture led him into the design business. While he was a sculptor, one of his friends, a garden designer, asked him to create furniture for a garden and that was the turning point for creating his own design business. He made a bird table, quite an expensive one with fine detailed craftsmanship, but it sold well with subsequent orders from the USA. At that point, he realised that the shipping cost of design objects overseas was prohibitive. The postage is more than the actual cost of the products because of the weight and volume, and this was the inspirational moment for him to re-evaluate the designs for his own company with smaller sized objects for smooth shipping, delivered anywhere in the world (Figure 81).

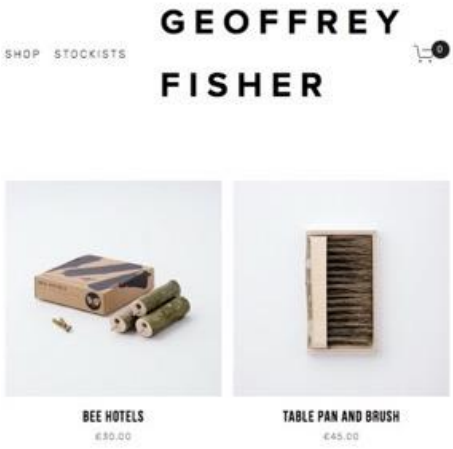

Figure 81 – His present work on his webstore on www.geoffreyfisher.co.uk

> All products are designed, hand-crafted and packaged by myself from my workshop in High Wycombe. Similarly, all wood used is cut by me, foraged from local woodlands. My ethos is to create simple but beautiful products that utilise, rather than produce, waste (Geoffrey Fisher, 2017).

All his objects are made using scrap wood discovered in a local forest, which usually goes to the woodchipper for recycling or consigned to landfill. Upon using waste materials, his designs are perceived as environmentally friendly products, Fisher has insisted that upcycling is not what principally he is doing. 'I don't do upcycling'. His understanding of upcycling is about restoring old furniture and changing to a newer product, and he believes that defining something in absolute terms should be more considered, as some people have a word forced upon them rather than choosing what they want to be called.

Thus, this maker has refused to be labelled via any environmental terms and declares that is not where the originality of design derives from. However, for marketing purpose, he has accepted the saving waste approach for his products to help grow his business. Putting a tag on works to tell how it is made, where it is rescued from, and the name of the material becomes a useful marketing tool as part of the production story. A product design business idea appeared coincidentally with a particular item, a hook, while he was still selling his sculpture through galleries, and exhibitions. It started with working on green wood, making a couple of hooks from old branches from a cut-down tree in his garden, and eventually started to sell to shops in London by walking in. This procedure looks to be an easy thing to achieve, but, at the beginning it was difficult and slow. He works part-time at a picture framing place at which he gained immediate feedback from customers and realised the hooks could be valuable as a commodity; this has taken him to the real business.

> My sculptures are very precise pieces of work, and it is very much of the idea is comes before the materials, whereas, what I am doing now is completely the reverse. You look at the materials and what can you do with the materials, because it is piece of natural wood that grows into a particular shape; it was the inspiration itself. Working with the shape and then seeing what you could with the shape rather than taking a piece of wood and then foraging in them into particular shape you want (Geoffrey Fisher, 2017).

Fisher loves working in opposing ways, using different design processes like those of product designers, then of fine artists and designers makers. Therefore, his design development is simple. He makes what he wants to make, to express a part of him, although he never misses a market research opportunity before production takes place.

At present, the bestselling item, using waste wood branches, is in constant production to cover steady and constant sales, but no significant issues of material sourcing were raised, except obtaining wood for stripping bark is only allowed during the summer. His most beloved product is *Trook hook* (Figure 82), which is such a simple product that fulfils all his design criteria: fully functional, easy to transport, and an entirely new and original idea. Fisher has concluded that people perhaps want better-quality work

with aesthetics and function, but at an affordable price; this is where his products fit comfortably.

Figure 82 – Trook hooks. Made from natural wood wastage produced when a tree needs to be cut back or comes to the end of its life. © Rowen & Wren

When he produces a new item, he considers a combination of favouritism and the public's perception to challenge the market. He does not hesitate in using all sorts of materials, from natural materials and galvanised metal to plastic. He finds the interface between the two – highly manufactured synthetics and natural, unfinished materials – fascinating. He has worked closely with retailers and improved his ideas according to their feedback; it is this process of commodity development that remains an important part of his business. Getting into retail outlets is arduous, and requires good products, persistence, research of the current market through shops, design blogs, and communication with people (directly with Fisher) to make it successful. He has asserted that getting himself out there is paramount for a small business like his.

> Designing and making this is probably 25% what I do. 75% is marketing and production (Geoffrey Fisher, 2017).

Geoffrey Fisher promotes his products through global communities such as 'Remodelista', a famous design blog in America from which he gained a distributor in America. Discussing and showing his design on the blog, and seeing the daily new outcomes are beneficial to his business. Furthermore, attending a design show once a year is another useful advertisement. His kick-off show was 'Grand Designs' and he realised a few years later that only certain shows, such as London's annual 'Design Junction', are a good match for his products; he says it is difficult to know this until he encounters them. Similar to what Jay Blade at Jay & Co says, the show or exhibition seems to only be advantageous when the products are shown at the right place for the target audience. What makes his products stand out, compared to other case studies, is the quality and design of the packaging, and Geoffrey said that this is essential.

> It wouldn't sell without the packaging (Geoffrey Fisher, 2017).

Considering his products are handmade, to compete against big manufacturers, they must be attractive and suitable for retailers to display. As his work is very much aimed

at retailers, foreseeing the packaging from the beginning is crucial. Packaging design requires being creative as its costs are dependent on colour, size, and materials. The first version was made using existing packing materials within a tight budget; after that, he created his own inkjet graphic printed customised box. The packaging has evolved from a cardboard tube with a label (Figure 83) to being graphically printed on the personalised box (Figure 84) Still, when specific sized boxes are needed, significant costs surmount for small businesses.

Figure 83 – First packaging design for the Trook range with cardboard tube and tag, 2017

Figure 84 – Customised box with printed graphics, 2017

Finding a cost-effective solution is key. Fisher now tries to design products that fit into limited sized boxes to reduce packaging costs. At the beginning, his design studio had financial difficulties from running the business, due to a slow return on investment and the long design process worked against him, even with such low material costs. These days, challenging retailers with the price is the hardest part of the job. Material sourcing and operating costs are easy for him as they are all established, but putting commercial value onto the product always requires homework and research. Attractive products are often seen and sell well, but trading in the market is not just about the design – selling is often dependent on the margin for sellers and distributors, which is usually between two and a half and three times the wholesale price.

> You've really got to think of good product ideas - if you are selling something for £10, the customer needs to feel a sense of value and worth (Geoffrey Fisher, 2017)

Designing products that require costing out every single component piece, such as labour, material, time, overheads, marketing, packing, making, research, and accounting is challenging. A headband designer on Etsy,[35] an online market, was unable to provide a wholesale price as the product to the customers is already at her best wholesale price. Selling to retailers gives her no margin, but increasing her current rate is also not viable due to all her other competitor's prices. With all these practical, but not insurmountable problems, Fisher never exceeds his product development time of more than two weeks (and, if possible, tries to finish within a week), as the long process of design development is the downside for trading at the actual end market.

If the idea is not original, interesting, and quirky with the right price, then it is increasingly difficult to sell it to anybody, so being open minded and seeking and taking feedback, negative or positive, is important.

> I am happy to take negative feedback to develop the product and I have to all the time. You have to. Otherwise, you end up making stuff that nobody wants (Geoffrey Fisher, 2017).

In his opinion, the biggest issue for a small business in design and making, is an absence of research of the current market. He insists on knowing what is out there and being open minded is compulsory for an advanced position in the market. Fisher is fearless of negative feedback because it is mandatory and is part of the development process for what he is doing. By speaking to customers and retailers, designers can learn what people like, what sells more than others, and what product category prices are higher. From that, the designer can still make something unique, functional, and beautiful with more chance of trading.

He sees people are designing and making stuff with their unique personality, which is acceptable when it is their hobby, but not necessarily when running a business. Producing goods that designers love themselves is straightforward, but this does not guarantee sales, which is the nature and purpose of the business, so investigating competitors in the market needs to happen from the outset. In his point of view, business is all about communicating with other people through the product. Once the products have been developed, the next step is taking goods to customers, which requires collaboration with people: makers, other sellers, retailers, designers, and buyers. Fisher maintains that the success of a business probably comes from a compromised adoption between others and designers' conflicting ideas.

> You have also got to be able to change, if you see something isn't working however lovely it is, you need to adapt or ditch it and make something else (Geoffrey Fisher, 2017).

For example, one of his ongoing developing designs is a traditional shaped greenhouse using glass and wood, but he soon noticed there are already a lot of his ideas existing in cheaper and bigger products under a well-established brand, with

[35] Conversation with the designer of LaLaLoop Baby clothing at Etsy, 21.07.2017

which he cannot compete. Thus, he will interpret them differently, either by using an abstract form so it is presented as a piece of artwork, or by having a simple modular set in three different shapes that can be attached to each other. Producing a commercially viable product with an original function and material use is feasible if it has a targeted price in customer appealing design. His products attract more individuals in high street shops than online because of their tactility.
Fisher constantly cultivates product ideas within a set budget for better margins, and small size pieces for easier delivery, which helps him to maintain his commercial success, for example his *Trook Slingshot* (Figure 85). Only 10% of his designs are selected for production, and he seeks constant feedback from his audience about his ideas.

Figure 85 – Trook Slingshot with its retail packaging on the twentytwentyone online shop. The Trook slingshot is an ingenious version of a traditional toy, which clearly demonstrates Geoffrey's design philosophy. © twentytwentyone

Fisher has suggested that new design business entrepreneurs starting a part-time job in a relevant area such as design retailing, need to be able to see what is commercially successful and take notice of the reaction from the public. Having a passion about what they are doing will make help to make businesses work. Nevertheless, the desire to follow an idealistic, stylish designer's lifestyle is not going to work. There is not one answer for success in the design business, but if someone wants to make a living by designing and making, they have got to be prepared for adversity.

> If it is a lifestyle choice, that is quite nice, glamorous then it ain't going to happen (Geoffrey Fisher, 2017).

Fisher produces everything himself including the design development, production, graphics, packaging, and shipping and is extremely careful to keep control of the various stages between product development and dealing with customers.
Like other designers in the case studies, Fisher also mentions that there is possible help provided by government for business advice, and this kind of support is desperately needed for artists because they are usually weak with business skills as he has done. Fisher started the business with a local government fund to buy large

equipment. Furthermore, he received financial support for exporting his goods to the USA from the UK DTI (Department of Trade and Industry) and still maintains contact with them, which contributes to putting his business forward for grant projects and export.

> I like the idea that people buy it. They like it … they buy it. Take it home …. it gets used. This is the way of connected people (Geoffrey Fisher, 2017).

By designing a 'precious' commodity out of this natural material, customers feel that they have had a positive experience through its acquisition. Fisher explains that his products can create sustainable business cycle by saving the waste from the forest, manufacturing products, earning money from sales, employing people to collect wood from forests, and maintaining the woodland by gathering coppiced trees.

5.7 Summary of chapter

Based on these five interviews, a few shared circumstances are discovered, such as the fact that interviewees are working almost 24/7 and they have to solve every job-related issue themselves. All of them work following an environmentally friendly path, (whether they have intended to commence that way or not); some diverse systems of directing workshops are also indicated, such as methods of promotion, target markets, trading channels, routes of business expansion, funding channels and sources, and future visions for business growth. Nevertheless, a couple of intersecting points of running a business from the case studies are determined in both strengths and weaknesses.

All interviewed designers enjoy running their businesses and have inclined toward pushing themselves to meet the requirements of customers, even though it was initially challenging and had to be sustained with part-time working. In addition to the foundation of good designs, occupying spaces with easy access and organisation of workshops with appropriate marketing, are the first things that should be considered for a design-led SME. To settle those essentials, some studios received support from the government, friends, or funds, but some did not. Designers with help found it easier in the beginning with the business set up, but in general they all had difficulty with a lack of resources, including finances, time, workforce, and materials, which are linked closely for the smooth running of a business. Some designers have advised that without enough funds at the beginning, building a company goes side-by-side with part-time work, but could be manageable.

Hunt, from the company Hendzel & Hunt, joked, 'Don't do it' (Hunt, 2013) regarding the question about seeking advice for students who want to set up their own business. He says it is hard work, but worthwhile for someone who is ambitious about what they are willing to achieve. Blades from Jay & Co. says

> Mistakes and failures are the stepping-stones of growth and success (Blades, 2017)

People need money for living expenses so a gradually increasing business commitment alongside part-time or freelance work might be the ideal process.

The most common hindrance of working with using waste materials is the demands of longer processing time, and the difficulty in repeating the product due to the limitations with discarded objects on the ground as easily restricted by its size, quality, and quantity. Thereby, it is wise and frugal to employ less time in production and reducing time on production can be done either by limiting the time consumed during the making process or deliberately emphasising one part of the entire piece so it stands out. This entails designers' craftsmanship, creative thinking, and making skill. All five businesses, DZ design, Hendzel & Hunt, Furniture Magpies, Jay & Co., and Geoffrey Fisher commented that the additional use of new hardware and materials is unavoidable to invent a novel object. Public perceptions of this mode of upcycling is often disparaging to the expense of the idea of the object. As an example, feedback on DZ design *Drawers Again* (Figure 54) stated:

> Oh, you just get four drawers and put them together (Drewett, 2013).

Jay Blades stresses that the design must be memorable to the public like a song hook: 'a musical or lyrical phrase that stands out and is easily remembered' (Monaco and Riorda, 1980, p.178: Burns and Grey, 1987, pp.1-20). This analogy typically includes some repetitive, attention-grabbing, memorable lyrics and are easily remembered. Blades works stand out from the work of other upcyclers, as his peculiar style of adding dominant colour on one particular part has become his trademark. Geoffrey Fisher affirms that he limits the design development period to no more than two weeks. Work efficiency is vital; the product development period is the first step, and the next steps, such as seeking and receiving feedback for improvements, pricing, dealing with retailers, making, packing, and delivery need to be achieved quickly. Running a business and the development of designs are intimately linked and can affect each other. Accommodating time between many other associated jobs is fundamental for a running business.

Finally, the designers suggest that carefully targeted and focused marketing is inevitable for greater revenue, but sometimes requires a lot of resources, thus, strategic promotion is essential. Attending trade or design shows, social networking services (SNS), or blogs are the most widespread practices.

These are all imposed for regular daily, weekly, monthly or yearly updates. Online based SNS and blogs appear to be a good source for keeping financial costs down, but routinely uploading is essential for interaction with potential customers, by asking opinions and refreshing ongoing works. Jay & Co. adopts this method flawlessly through Facebook. In the whole month of August 2017, this studio showed 61 articles with images including sneak pictures of projects, completed works, thoughts of the day, or self-interests. Blades never misses a day grasping people's attention, and he subsequently gets more people liking and interacting with his Facebook page.

With display-based marketing via annual fairs, a lot of capital cost and preparation time are involved. Hence, identifying the correct exhibition for the products is indispensable as stated by Fisher. Presenting products for retailers with pricing, packing, stock and delivery times, and availability must all be considered. Furniture Magpies exhibited new designs at the London Design Festival every year, but financial costs far outweighed its yield; the company has since exhibited at small craft fairs. On the other hand, Jan Hendzel and Geoffrey Fisher are carrying on the show

annually at Design Junction in London.[36] Showing designers' recent projects at Design Junction, is a way of increasing networking with other international design groups.

To attract clients, a comprehensive marketing package with its narrative, labelling, images, retailing casing, delivery mode and method, and pricing are essential. Every single piece of the package will be distinguished by the public and the impression of work spreads simultaneously by word-of-mouth and through social media. Therefore, little things that are easy to miss during product development should be deeply considered; public opinions must also be embraced. Another action to consider when generating an item is that it should be a continuous supply for repeating orders. For example, then, the making method is simple and duplicable using easily accessible materials.

Through the research, the common advantages and disadvantages in the design business sector with waste materials have been cited and product development using abandoned surroundings have shown opportunity for trading like any other business. Having your own firm requires a significant constrained commitment and organised management in all aspects, a targeted marketing strategy with the right pricing and grasping a financial condition, scale, and ability of their own. This is probably why businesses within this sector are not easy to find in the current market; however, this initial problem can be improved and encouraging more young designers to engage in the use of waste materials for their designs is viable. The five design groups' contribution to this research has helped to collect the information on how they are managing their businesses and what practical outcomes can be influenced, for example, using waste materials. Thus, the findings have been adopted and adjusted to show how design can be influenced when this information is acknowledged beforehand and to suggest a useful guide for start-ups.

[36] Launched in 2011 by a team of industry experts and offering a wide range of high-class eateries, design led pop-up shops, installations and other interactive features that strikes the balance between creative and commercial, About us, Design Junction Website, www.thedesignjunction.co.uk, 19.09.2017

Chapter 6. Design practice and application of research findings

6.1 Introduction

> Why make yet another style and shape of chair when things for other uses can do the job just as well? (Dixon, 2000, p.22)

Tom Dixon indicates that existing technologies or objects can be adapted to new functions (Dixon, 2000) and an image from his book *Rethink* (2000) explains what he means by an old lady using a wheelbarrow as a chair (Figure 86). This is a good sample of substitution of its original function to new function. Using the objects for various possible functions could be better for the environmental. However, many chairs are manufactured not because people cannot utilise the object and its possible functions, but because of their desire for new aesthetics.

Figure 86 – A wheelbarrow's new second function – sitting ©Rethink, Tom Dixon

According to Postrel (2003), aesthetics is not a luxury, but a universal human desire, and data collected from this study regarding consumer's perception of products using discarded materials (see Chapter 4), has proven that people purchase goods because of perceived innovations within their design. Data analysis from the survey has shown the possibility of making products using waste materials if the design of products meets the public's desired beauty standards.

The most influential thing from all the case studies is the time management between production and other office works including marketing. In 2012, Furniture Magpies had many difficulties, such as a lack of the exact material sourced for a particular product, a great deal of hand cutting and making, making packaging from scrap, self-delivery, and no permanent workshop, which required more time on production between problems, eventually affecting the rest of the business. Problems with time management is one of the main reasons why the former company turned its business direction towards education and television presenting.

Figure 87 – Broken dining chair, free of charge as it was rescued before it was dumped

Like Furniture Magpies, when the business is micro sized, each element has to be appraised and made efficient at every step such as design development, the making process, moving lines within the workshop, organising storage, and even paperwork, which lead to find the correct prices and a suitable profit.
Richard Zakss from DZ design (see case study 5.1) has said that they were starting to use a stopwatch to get an idea of how long the production takes to revise prices. Product pricing seems problematic for every designer, and this study realised how the making time could be significantly affected by other facets of the business.
Regarding the focus of this study, this chapter has mapped the creative development of two products, a coat rack and door wedge designed by the author while a partner in Furniture Magpies to see the progression of their original design, and three new products, a light, candle holder and ring holder designed by the author since leaving the company, by applying the data gathered before the practice. This chapter explores what design approaches can be addressed in the production of reusing abandoned furniture waste and explains the decision-making process of the designs by individual craftspeople.

6.2 'FM coat rack' from 'Lovely Chair Leg coat rack'

The coat rack is a design development from the Furniture Magpies' *Lovely Chair Leg coat rack* (Figure 88). The Lovely Chair Leg coat rack is made using rescued chair legs that stand out as hooks at various depths. The rack comes in its original finish (no new treatment applied) and retails at £39.50, delivered in a hand-cut and assembled box. Although this was one of bestselling items from the company, the profit margin was unsustainable. Thus, this section focuses on finding the issues involved and suggesting solutions.

Figure 88 – Lovely Chair Leg by Furniture Magpies, 2012

Design issue

Furniture Magpies believe that every element of discarded furniture retains a beauty of the original makers' craftsmanship, which should be preserved in its as-found condition with dowels and screw holes. Showing the previous life of the material in the product seems the best way of highlighting the beauty of its original use and it has nothing to hide from the audience. By using materials in their original condition, it creates a product that has a uniqueness from the materials and this makes distinctive pieces that cannot be duplicated, easily copied, or mass produced.

Furniture Magpies is also convinced that it was taking the best possible approach for the environment by saving unnecessary energy and labour; it did not see a reason for adding another surface coating to old furniture. However, presenting the previous use and function of the product has become a downside for the business by giving the impression that the product still looks like an uncompleted piece of work to some purchasers. The creative concept behind Furniture Magpies is more like following the concept of Process Art, during which the ephemeral nature and insubstantiality of materials are often showcased and highlighted (Lumen Learning, 2018) through the natural process of changing its original forms. The process of creating art is more important than the finished product, which can be a different view for consumers who pay for the finished product and its functional utility.

At that time, to enhance the story of the waste furniture's historic context, the production process never seemed to consider time consumption or energy saving, but involved a complicated production process involving many steps:

- Hand cut of each hook (Figure 89)
- Using various size of Forstner bits[37] for the holes of hooks (Figure 90)
- Hand chiselling to make the circle male part for the holes (Figure 91)

[37] Benjamin Forstner invented this clever drill bit back in the mid-1800s. It has a cutting rim or teeth around the perimeter and a small spur in the centre. The bits come in a variety of sizes, up to two inches or more in diameter. Ron Hazelton.com, 10.12.2018

- Made the hooks all in different lengths every time
- Hand-cut and assemble box from a cardboard sheet (Figure 92)
- No overhead cost was considered – such as studio hire and time for making.

There was progress in the production efficiency of using machines, by using a lathe (wood turning machine) instead of a hand chisel to make the male part of the hooks; the machine was not always accessible, causing delays in production, but this did not make any significant improvement.

Figure 89 – Hand-cut hooks from the entire leg length to the preferred shape, no matter what the length is

Figure 90 – Different sizes of holes made depending on the size of the hooks

Figure 91 – Hand chiselling on the back of the hook to fit the hole

Figure 92 – Postal boxes made by Furniture Magpies, 2012

Design development

> An aesthetic of sustainability could be a common ground for the appreciation of humankind's innate affinities with beauty and nature (Crouch, 2015, p.38)

Other than the problem of production time, the author still believes in the concept of showing the previous life of the products, so has tried to find an alternative way of preserving the story of discarded materials without prejudicing the views of the consumer. Because of the central issue of the coat rack demanding a great deal of production time and labour, there needs to be consideration of reducing time on the male part of hook using hand tools. Instead of changing the individual Forstner bit to make different size of holes, identical 10mm holes have been drilled on the body of coatrack and the hooks then connected with a dowel. By doing this, it reduces time tenfold over previous making methods, including changing the hooks for its preparation (Figure 93). This has been a natural and instinctive decision that comes from experience: the skill of maker who sees the hooks are still working functionally, look attractive, and are structurally strong.

Figure 93 – 10mm dowel drilling and fixing on the body of the coatrack and hooks

Another method that minimised time is making a rule by setting a certain length for each part; for example, the coat rack body is 420mm for the shorter one and 650mm for the longer one (Figure 94); the hooks are 50mm and the interval between the hooks is 130mm. Instead of measuring every single time of production to fit to the length of a chair leg, the length of the body (chair leg) of the coat rack and its hooks have been determined by the dimensions of existing packaging available in the UK, thus reducing time to construct boxes and allowing for more efficient postage and packing.

Figure 94 – Cutting the leg to 650mm

Although the length has been set according to the requirements of time minimisation, the most important thing is that the beauty of this coat rack is not lost in the process. A rhythmical pattern in its design is key to its aesthetics, allowing the user to feel its movement following the curve of the coat rack body. Adding various shape of hooks enhances this movement on the rack, which was loved by members of the public when it was sold through Furniture Magpies, and many wished this to be retained. Despite cutting it to a certain specified length, emphasising the original form of the waste materials tells their story through their appearance (Figure 95).

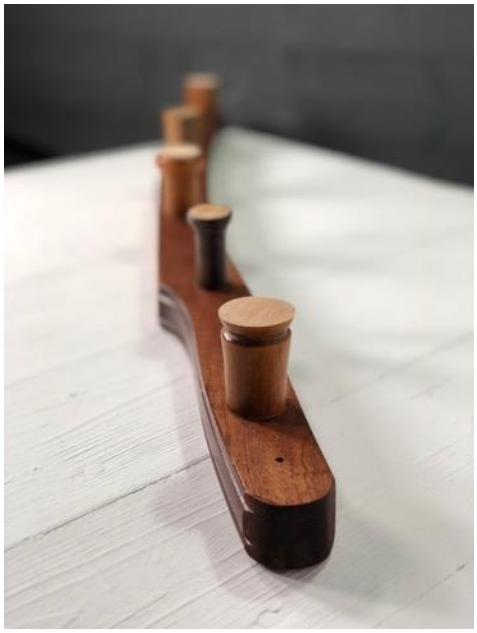

Figure 95 – Making movement by using various shape of turned leg followed by the coat rack body, but in identical length of hooks

Two new additional design developments were made, one for the surface and one for the shape on the hooks. For the surface, adding colour, cleaning, pattern-making, and peeling on the surface has been experimented with and for the shape, straight-lined chair legs and its constituent parts for hooks on the original design, which only used turned legs, has been adapted (Figure 96). The reason for elaborating these two particular experiments is to increase the versatility of these waste materials and to save as much waste as possible with a view to minimising environmental concerns. By playing with the exterior finish of waste materials, it could reflect and alter the consumer's opinion regarding the worth and value of the piece. A slight trace of dirt and patina has stayed after cleaning and major damage or obvious contamination has been planed down to reveal the underlying timber for a newly completed look.

Figure 96 – Planed body with coloured stain, scraped original colour of waste material for stripe pattern and straight lined chair leg for hooks

As the products are designed for trading, the price has also been considered at £49 (2018) to compete with well-known retailers in London, such as SCP, twentytwentyone, or Purves & Purves. Thus, calculating the production costs is inevitable and the cost at £7.50 per item has been set including overhead costs followed by the pricing guide in section 6.6. This has been made possible by following the production strategy below, which is the result of experimenting with the most time-efficient methods without losing the design aspects desired by the designer. For marketing purposes, the words 'chair leg' have been removed from the original name of the coat rack *Lovely Chair Leg coat rack* and renamed *FM coat rack* (Figure 97), because some people get a negative impression of waste materials for (see chapter 5).

Production strategy

1. Dismantle the waste product or material into its constituent parts
2. Clean the waste material
3. Cut into the length required
4. Mark the centre
5. Drill the hole for both the hook and the body
6. Plane the body
7. Sand the body and hook top
8. Fix doweling with glue to securely connect the components
9. Colour and add a new finish

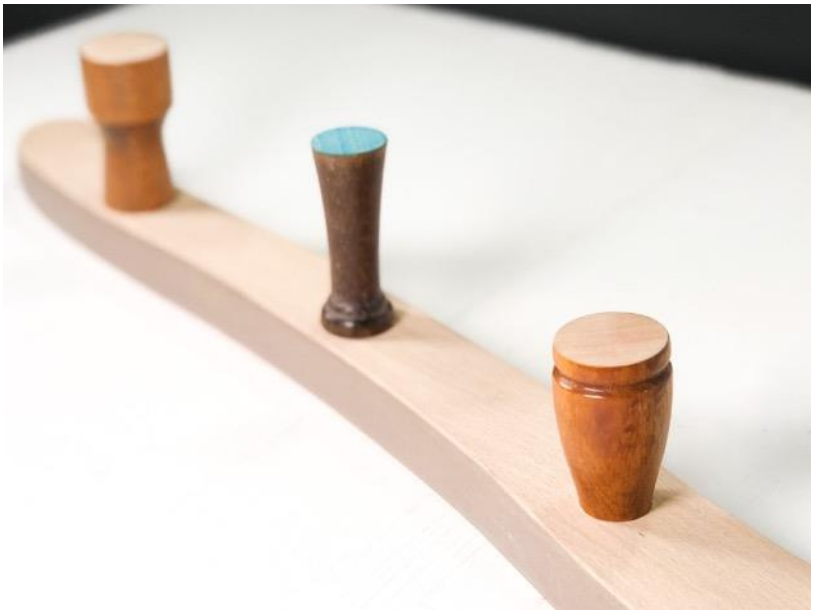

Figure 97 – FM coat rack

6.3 'Stuck door wedge' from 'Tweet Tweet door wedge'

A second object developed from previous design work is Furniture Magpies' Tweet Tweet door wedge (Figure 98), originally transformed from the top part of dining chair legs, it was changed into a hummingbird shape. It was a straightforward process as it only needed the top of the particular shaped leg to be cut as the component was an off-cut from the other part of the dining chair leg (Figure 99).

This was also one of Furniture Magpie's bestselling items with a retail price at £9.50 through online retail stores such as Not On The High Street, and high street shops. The profit from the door wedge seemed positive with both online and high street shops until demand increased and a shortage of materials for its production became an issue. Thus, to improve the commercial viability of this product, this section identifies the problem and develops an alternative solution.

Figure 98 – Tweet Tweet door wedge by Furniture Magpies, 2012

Figure 99 – The side part of the dining chair leg that has a curved top for the door wedge's head, 2010

Design issue

The problem with the door wedge was that Furniture Magpies could not meet the demand for the product, and had to produce the door wedge from other furniture parts, not just from chair leg tops like in the original version, which led to an additional process of cutting the shape. Later, producing more of the door wedges became more manageable with a changed smooth curve for easier sanding using a drum sander (Figure 100). It was a simple attempt to speed up the process, but even so, it took ten minutes from its cutting to achieve a finish, which means that with the recommend price, it is unprofitable. Even crafting from scrap never made enough profit for the business. Handmade wooden door wedges are built between £12 and £16, and this is the critical price range. This is the perceived price cap for the product, especially when made with waste materials. Either the amount of time taken for production or the selling price needs to be changed to make a profit at this limited price range. The issues that need to be solved include:

- Cutting the complete shape from the scrap material (Figure 101)
- Time for sanding
- Repricing into a higher price bracket

Figure 100 – Simplified version of Tweet Tweet door wedge by Furniture Magpies, 2012

Figure 101 – Door wedges cut out from the top of an old table, 2013

Design development

Without using expensive technology such as CNC (computer numerical control) or laser cutting, reducing the production time is almost impossible for a small business. As the motivation of designing and making is to use available tools and materials to hand in the environment, using a high-tech machine is not an option. Therefore, the entire design has changed to reduce the cutting and sanding time. The design has been modified within the range of waste material used in this study, so the process and the materials can be shared and allocated to other developing products of the practice. Instead of the side part of the dining chair (Figure 99), turned chair legs have been used. The original unique form of the chair has aroused the maker's curiosity of the inner appearance of the material, and this has been played out though cutting the material. Using a straight linear cut (Figure 102) to divide the chair leg into two diagonally (Figure 103) reduced the making time and exposed the original beauty of the craftsmanship in the waste material. When Adamson (2007, p.59) discussed the materialisation of the art object, he quoted Philips (1989, p.101), stating "the way in which something has been produced shows itself in the finished product". By cutting a section, the material divulged the wavy shape and showed the previous work (wood turning lines) that is hidden inside. Planing or machining the original surface gives the product a fresh, clean look that audiences are looking for. With this alteration to the design, the price can stay within the price range and can possibly make a profit (Figure 104).

Production strategy

1. Dismantle the waste product or material into its constituent parts
2. Clean the waste material
3. Plane both sides of the components
4. Cut into a diagonal line to see its section with the length required
5. Sand the bottom with 80 grit sandpaper

Figure 102 – Straight cutting

Figure 103 – Cutting in half and planed tops on the chair legs

Figure 104 – Exposure of its original beauty

6.4 Build Up Light

The lamp is a new design that has been developed based on the findings of the study. Together with the four other products in this thesis, it has been produced using common furniture waste materials which are waste furniture parts, especially parts from discarded wooden chairs. Wooden chairs have been chosen for their easy access and availability for making and handling with hand tools. From the case study interviews (Chapter 5), a couple of the designers mentioned that the public's perception of products made using waste materials was that they could easily make them themselves. This is conceivable because the media used are familiar and can be easily sourced as an everyday object. Thus, the approach for this light has been to create a more creative and technical product with the waste's original aesthetic and incorporate the designer's authenticity in the product. In the stage of dismantling the

furniture waste, the designer gains new insight into its construction and the use of materials that help to inform the new design. The improvisation with the existing form to create the new function is part of the designer's authorship. As a jazz musician playing harmonic reversals is disciplined by what came before (Sennett, 2008, p.237), the designer has selected elements of their own materials that can respond to their different visual appearances.

Design development

Furniture Magpies had a previous product range of lamps, and the experience of making the lights was helpful for understanding the product and its requirements as an electrical product in areas such as electrical safety for users (Figure 106). Remembering the hard work in wiring the cable and producing a big piece for a couple of days for one item, minimising time in production with a simple design that promotes waste materials in their original form has become a priority for this practice. The rudimentary elements of an ordinary lamp, the bulb, cable and shade, have inspired this design. Utilising the original beautiful shape of a turned leg to be a lampshade (Figure 106), everything else has followed the making process that depends on material sizes and types, as some cannot be optimised for its intended use, only a certain type of materials has been allowed to define the characteristics of the design. For example, in the beginning, inserting a coloured cable into a pre-cut length of the furniture part (in a set of three various shapes) would work conspicuously in contrast for its elaborating design with its different colour (brown timber and dominant cable colour), shape (ragged line of wood and straight line on cable) and length (short and thick timber and long and thin cable). These contrasting matches seemed enough to highlight its attractive appearance in the design sketch.

Figure 105 – Warning sticker for safe use

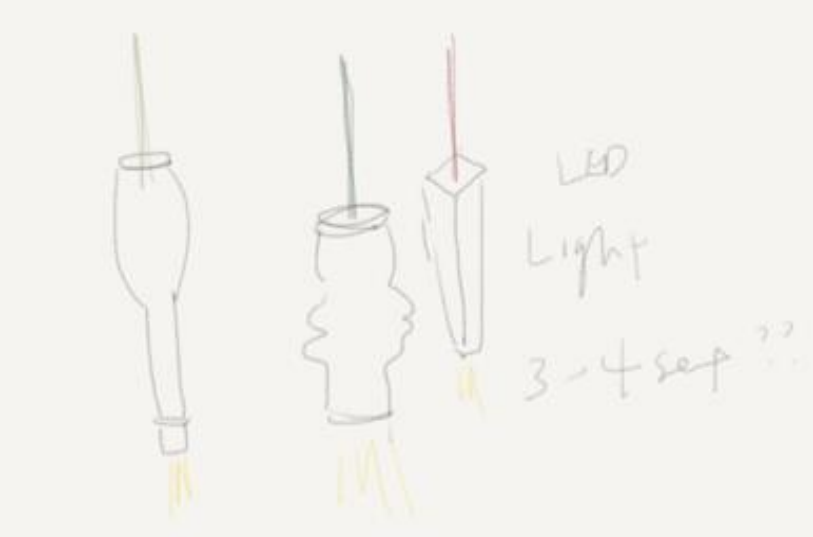

Figure 106 – Design sketch of the light

However, when the physical materials to hand were assembled into the design, it just looked like a chair leg dangling on a string, and to produce the timber light with the required length of 150–200mm (Figure 107), it was difficult to make a hole large enough to fit a light bulb with a Forstner bit.

Figure 107 – Pre-cut in 150–200mm for the shade part

As a design development, cutting the material into a shorter length for the bulb fitting and adding a disc from other waste timber (Figure 108) to provide a tapered shape gives it more of an opportunity to stack in a unique way (Figure 109). Experimenting with various shapes of the material has created the versatile look based on the designer's imagination, and the choice of materials has been made to allow the noticeable contrast but harmonise at the same time. Furthermore, the process of cutting the timber into short pieces, handling the timber with hand tools and wire assembling for timely production have become manageable. This not only reduces the time, but also saves the indented aesthetics from the original sketches (Figure 106).

Figure 108 – Cutting into shorter lengths for the shade with wooden discs from a discarded table

Figure 109 – Various stacking possibilities using shortened materials

As electrical products need to meet current safety regulations,[38] the need to add new materials to the design is unavoidable. Therefore, the coloured fabric cables are a new material that has been chosen inspired by an ad-hoc concept for this design to give a bright appearance which contrasts with the timber to disguise its perceived lack of beauty. While developing the design, this research has investigated the standardisation of product dimensions (Figure 110) for any materials used to reduce the production time for significant batch sizes of discarded materials as they are already in predefined sizes. Although the decision-making on the materials' dimension

[38] To ensure a safe product, you need to design and manufacture it to recognised safety standards. These standards cover items such as shades, lamps (the industry term for light bulbs), lamp holders, and the complete light fitting, which in the lighting industry is called a luminaire. For luminaires, the main standard is BS EN 60598-1 and it is available from the British Standards Institute. The Lighting Association guide on how to get into lighting, Lighting Association, 2011.

with previous work at Furniture Magpies was visual and based on instinct, this design requires a production time limit, so restricting the dimensions is an essential process. Nevertheless, selecting materials within the standardised dimension to look proportionally balanced in the product is still an aesthetic judgement. To identify the right measurement, the use of existing packaging and light bulbs has been considered to minimise unnecessary processes and to maximise the efficiency of producing with a compliant procedure like electrical wiring, and therefore providing guidance for its assembly (Figure 111) is indispensable.

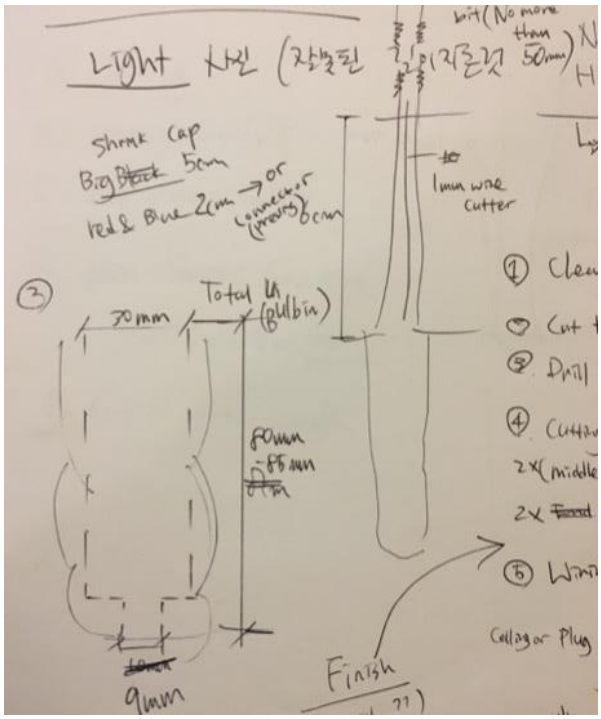

Figure 110 – Right measurements for assembly

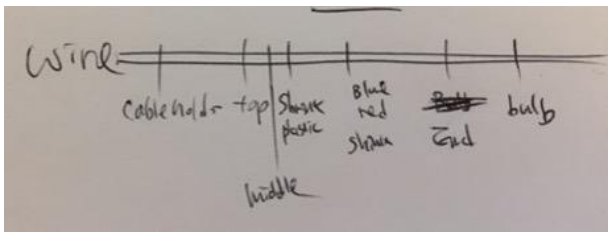

Figure 111 – Wiring arrangement

Like other products, if this Build Up Light (Figure 113) is made within an organised environment, as shown below, the light can aim to retail at £60–£70, as it has been made in the most time-efficient way without losing the designer's repurposed aesthetics of waste materials using a technical approach to electricity which is not easily accessible by the public.

Production strategy

1. Dismantle the waste product or material into its constituent parts
2. Clean the waste material
3. Cut it into the length required
4. Mark the centre
5. Drill with a 30mm Forstner bit (7cm deep) on end part for easy access to change bulb (Figure 112)
6. Drill in 10mm in both parts
7. Sand (exposed area in fine grit, but hidden in rough grit)
8. Connect wire after pushing the cable through the materials
9. Glue the entire pieces

Figure 112 – Space of at least 30mm needed to change the G9 bulb

Figure 113 – Build Up Light

6.5 Ad hoc candelabra

This candelabra has been developed by focusing on the retail market, which requires easy storage and transportation of the products. The memory of previous work in Furniture Magpies has influenced the choice of particular materials from the furniture waste, as the products from Furniture Magpies often had a shortage of materials. Constant and mass supplies for retailers are essential, and a choice of the furniture waste within the category has become the core of the design. Therefore, this design has grown from a simple and straightforward idea, yet has created a personality from its previous use. The natural beauty of the material has characteristically formed by improvising the function of the candelabra and disclosing an appreciation of the inner individual timber type.

Although the idea has been improved compared to the previous project, the initial sketch of this product was far more complex (Figure 114) because the making process involves completely different material, glass bottles, so it was necessary to simplify the entire project.

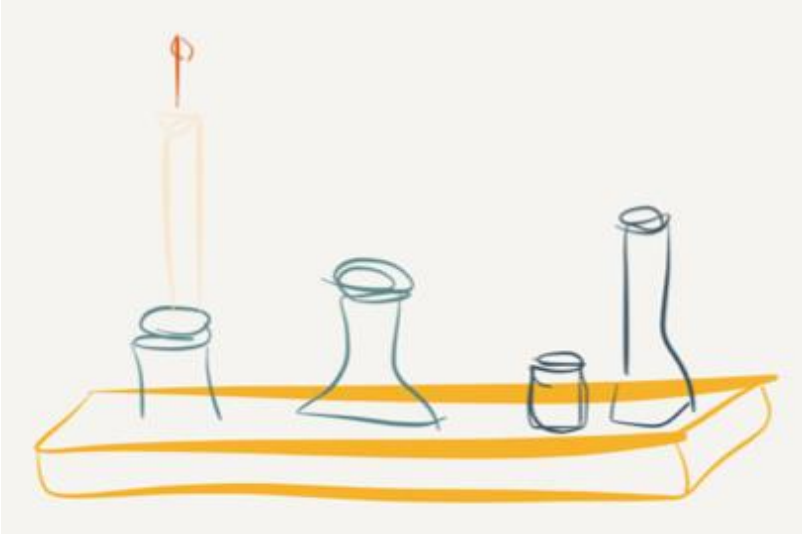

Figure 114 – Sketch of initial stage of candelabra

Design development

Exploring the concept of concealing the apparent origins of the raw waste material has led to experiments in peeling its skin, a coating or colouring on the timber, to see the neat part (Figure 115) to create the impression of a newly processed aspect, which revealed the contrast within the object. “Getting things in perfect shape can mean removing the traces, erasing the evidence, of a work in progress. Once this evidence is eliminated, the object appears pristine” (Sennett, 2008, p.258) and can be processed by craftsmanship. Experimenting with the action of touching, cutting, shaving and reforming the waste materials has led to finding the secret of the alluring shape of the materials. The hidden cross section of the waste material that is hard to imagine until the surface of the material is removed aroused the curiosity in the under-skin’s appearance and even felt captivating because of the difficulty in visualising it.

Figure 115 – Planed material to show its hidden shape of beauty (top) and scraping the paint to reveal the colour underneath (bottom)

Finding the right hardware for holding a candle has been critical as the designer deliberately accommodates readily available objects to hand to fit the required function as an ad hoc "a purpose immediately fulfilled" (Silver, 1972, P.16) approach. Searching for an appropriate type of metal candle insert or working with an easily accessed and secure insert on the material is the key, and a plumbing copper reducer has been matched for its purpose and is available to hand (Figure 116). Restyling the plumbing part that is available in the market for an alternative function is an environmentally friendly approach as it consumes less energy by reducing a new creation to fit the specific purpose or size.

Figure 116 – Copper end-reducer for the candle insert that comfortably fits existing hardware for its new purpose

Following this, the making experiments started, such as making a hole to match the size of the 18mm candle insert, setting the length of the candelabra body, and selecting the shape of the end of the body. The size of the candle insert hole was made followed by the copper end-reducer, the length of the body was determined based on the size of the available market packaging measurement (see section 6.6), and the end-shape of the candelabra body was chosen to be straight in contrast to the ragged curvy shape of the original material (Figure 117).

Figure 117 – Complete cut for the candle holder end

Experimentation with the candle insert hole ended in selecting three holes (Figure 118) in total to emphasise the proportion between the flat-low-long body and the long-thin candles when they are in place. With this result, it was possible to minimise the time for the production as the Forstner drilled holes were reduced from an initial number of five to three for the aesthetical purpose of the designer's own view (proportionally spreading the complete shape with its functional use, Figure 119).

Figure 118 – Holes made by 18mm Forstner bit to hold candle cups

Figure 119 – Candelabra with the candles in place

As a result of the design development, the candelabra can be produced in less than nine minutes, which means that the expected price of around £30 can be competitive with other candelabras in the market.

Production strategy

1. Dismantle the materials from the original structure
2. Clean the materials
3. Cut them into the length required – 400mm
4. Plane two sides
5. Mark the centre
6. Drill holes with 18mm Forstner bit – 15cm distance
7. Sand (exposed area in fine grit, but hidden in rough grit)
8. Glue the hardware to fit to the timber
9. Apply new finish

6.6 Arti ring holder

Initially, the idea of building with leftover pieces of other products by inserting a thin object from the designer's immediate environment would have worked as it showed a palpable contrast by sketching (Figure 120). However, it was felt that the actual outcome lacked the beauty, the contrast and the proportion of a whole form (Figure 121). Therefore, using offcuts from other products has been explored, and stacking, slicing, drilling and colouring was experimented with to enhance the aesthetical appearance.

> Preciousness is not only the value or quality of the materials themselves but more so the journey of transformation they represent (Juli Bolaños-Durman, 2018).

This product is a result of experimenting with the construction for a functional use with waste materials like Juli Bolaños-Durman's work *Ode to Intuición (Figure 122).* This contrasts with Juli Bolaños-Durman's work, which is a non-functional sculpture, however, as this product needs to offer practicality for its user, so it has been developed as a small ring holder to increase its competitiveness in the market with an enjoyable design as a decorative interior piece.

Figure 120 – First design sketch of the ring holder

Figure 121 – Mock-up of first version of the design idea

Figure 122 – Ode to Intuición Series by *Juli Bolaños-Durman, 2013, © julibd.com*

Design development

This study has looked for inspirational design in history to improve this product's outcome from the first version of the mock-up. *Mini Totem* (1990s – miniature version of 1960s *Totem*), a sculpture by Ettore Sottsass,[39] is the latest version of his first design Totem (1960s human-sized figure expressing the desire to ascend towards the heavens) (The Met Museum, 2018). Sottass's original idea for the design was developed from a drawing of vertically stacked brightly coloured pills that he had to swallow each day, and it translated the drawing to large stackable cylinders, turned on the wheel, white or hand-painted with bright colours reminiscent of road signs (Phillips, 2018) (Figure 123). His design development has been inspired by everyday objects, pills, and it has been sublimated with the designer's own perception and has evolved from a simple pill stacking shape into a more diversified form, which is the designer's intentional approach to express the irregular shape and size of detritus. It has been the most inspirational model with its pleasing look by stacking tiny individual segments into one piece.

Figure 123 – Mini Totem by Ettore Sottsass, 1996 © Paddle 8

The development of this idea started with cutting the furniture waste into small bits together with rescuing offcuts from the other products (Figure 124). In this way, little

[39] Ettore Sottsass is an architect and designer who participated in all the radical movements whether in the 1970s and 1980s. He is one of the most influential and important figures of the last century and founder of the Memphis Group that changed world design. Retrieved from https://www.memphis-milano.com/collections/ettore-sottsass, [Accessed 17. December 2018].

was discarded. However, larger numbers of the small timbers are too thick to use to hold rings because of the variation in ring sizes, so it led to one more step of design refinement. To improve the design, finding acceptable materials is imperative. The material has been influenced by the site visit to the London Design Festival 2017, which demonstrates the contemporary design aspect. Based on the observation of the trend of the show, sleek metals have been adapted for the part of this design practice to give a fresh look to the public (Figure 125).

Figure 124 – Cutting material into smaller pieces and rescued offcuts from the four other products

Figure 125 – Design trend in London Design Festival 2017 (left); The Qualia Collection by Azadeh Shladovsky (right) produced by HAVA STUDIO

Two types of metal, brass and copper, in solid rods or tubes were explored as they are easily accessible and approachable for immediate use, test and reaction within the designer's environment. The mixture of both metals was experimented with for its

surface, length, diameter and end-closures to be worked satisfactorily. The textural contrast between timber and metal harmonised felicitously, and a wooden cap was positioned at the end of the copper pipe to highlight this (Figure 126). According to Sennett (2008, p.221), in most work we estimate how long it will take; resistance obliges us to revise, so it was decided to add finishing touches on the metal surface of the finely sanded exterior to maximise the production time efficiency without losing the metallic beauty (sleek and shiny) (Figure 127).

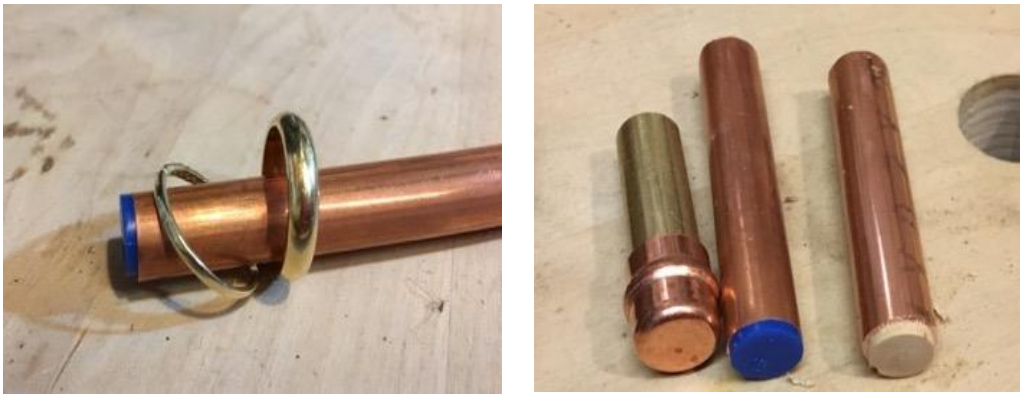

Figure 126 – Copper tube and brass rod in working progress (left), finding right diameter for rings (right) test for an end finish

Figure 127 – Design progress by stacking diverse cut timbers and applying the metal part

Furthermore, natural colour dyeing was experimented with to obtain the feeling of a new touch to reduce the public's negative perception of waste. Applying artificial colour (naturally sourced wood dye) creates a new finish or refines the appearance of the product. With these experiments, it was possible to ameliorate the function, form and face of the product (Figure 128).

Figure 128 – Result of colour adding experiment

The estimated retail price for the product is £30 not only due to its function, but also due to its abstract visual as an art piece. This has been possible because the production cost was reduced to £3.10 by sharing of the making process stage with another four products after its cleaning stage.

Production strategy

1. Dismantle the materials from their original structure
2. Clean the dirt from the previous life
3. Cut into the length or get offcuts from the other products
4. Mark the centre
5. Sand to expose cross-cut section
6. Drill with 6mm for connection part
7. Add colour if needed for a different version for its design
8. Glue timber sections with dowels
9. Drill with 10mm on the top surface of the object
10. Insert metal pipe with its end cap
11. Finish treatment for protection on the section

6.7 Pricing and Marketing

In the discussion with five design groups currently running within the waste material sector (see Chapter 5), pricing has arisen due to its importance. There is much

information on how to price for crafts (see The Design Trust,[40] Etsy,[41] Craft Fairs UK,[42]) and it may seem complicated as we may not be professionally business-minded at the beginning, and missing a few unexpected costs is often detected after a couple of sales. Peta Levi (a founder of the New Designers exhibition) stated that the art college graduates she saw had talent but "nil business acumen" (Design Trust, 2018).
Observations from Etsy, one of the most influential international online markets for designer- makers, provide a basic formula for pricing, which is Materials + Labour + Expenses + Profit = Wholesale x 2 = Retail price, and it has a listed category for pricing in plain language (Maveal, 2017):

- **Materials:** the little things like the cost of thread, and the bigger things like the cost of packaging.
- **Labour:** you are the designer, the marketing department, the accountant, the janitor, and the administrative assistant, too.
- **Expenses:** bubble wrap, that eBook purchased at 3 a.m., studio rent, bus passes required to make it to the studio every day, a new scale for your shipping station.
- **Profit: Think hard:** this number really depends on what you are selling, and will make up for someone like a printmaker, whose material costs are low and labour hours might be low, but who should be paid for their unique talent and point of view!

This still does not appear clear or defined enough to allow individual designers to set the margin themselves. Thus, this research adapted the formula as below in a more straightforward way for general use for any entrepreneurs to be guided, including the designer's own practice:

- (Materials + Labour + Expenses) x 3 = Wholesale (Exclude VAT)
- Wholesale price x 3 = Retail price (Include VAT)

Instead of adding profit separately per product, triple the product cost for the wholesale price and multiply it by three to consider the retailer's margin. In this case, the labour and expenses have been considered with processing time by the minute to obtain an accurate figure.
Reducing the product cost is the most achievable way to have higher profit. This research has found that marketing needs to be considered at the beginning to make this happen. It is recommended that the marketing includes costs such as packaging design and packing materials for retailing, logo design, running a website and photograph for its branding, and finding the right thing in a limited budget. All these costs can be considered in the first step of calculating the price as the expenses. For this practice, the packaging material has been viewed from the evaluation of the design idea sketch (

[40] Craft Fairs UK is an online community of crafters and craft fair event organisers. www.craftfairsuk.com [Accessed 1 December 2018].

[41] Global marketplace for unique and creative goods. www.etsy.com [Accessed 1 December 2018].

[42] The Design Trust is an organisation that supports designer-makers who want to set up in business. www.thedesigntrust.co.uk/ [Accessed 1 December 2018].

Figure 129), and all products are designed to be packaged within current commercially available boxes to avoid production of a new box set to reduce the cost and the energy consumption (Figure 130).

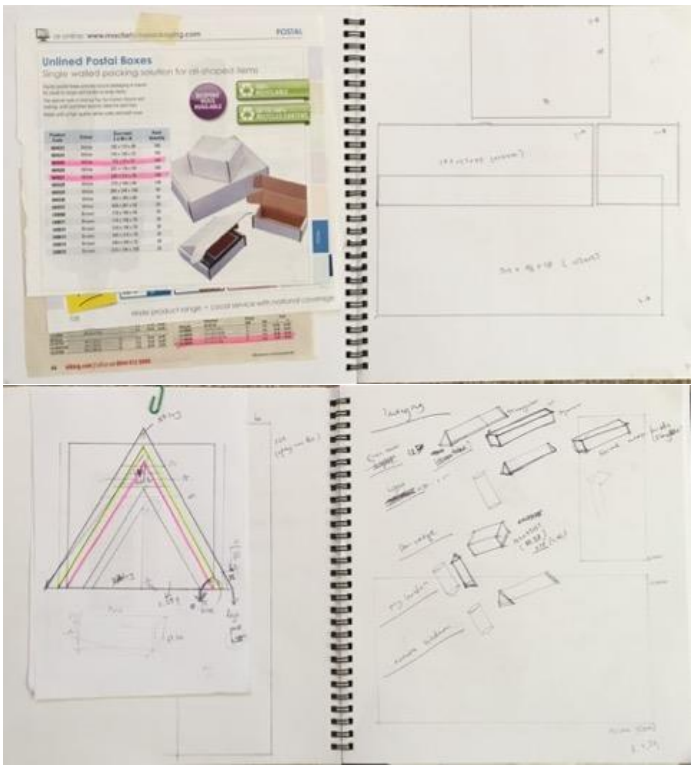

Figure 129 – Packaging search with its measurement in the current market with a design sketchbook

Figure 130 – Round and triangular postal tubes were chosen for easy transportation and storage in a retail outlet ©Kite Packaging Ltd.

As every interviewee in the case studies emphasised the importance of marketing, a website and Instagram have been considered as marketing tools for the practical outcomes. As Instagram is a platform that includes images, it can show the process of making and the products more distinctively with less description. With a snapshot

of the work, it can easily emphasise the aesthetics of products and explain the environmental concern through craft. Another marketing approach has arisen regarding the branding, including the packaging. The packaging design has been considered to include the name of the business and the logo, which is predominant for establishing the brand. The company name is followed by the designer's surname 'Lee' and the design 're-see' to show the waste in a creative view. It means that the designer, Lee (re)sees the waste in a different perspective to create the product. The name has also been considered for its benefit of being easy to remember and pronounce, without sounding complicated or overly familiar, so it cannot trigger either a negative or a positive effect. The company logo design (Figure 131) has been inspired by observations of the waste material, showing the character of timber with the company name. However, this does not show the environmental consideration in the title to reduce the negatively biased judgement of a product made using discarded materials as it only exposes the craftsmanship of the furniture which can be interpreted as the construction of the furniture instead of waste pieces.

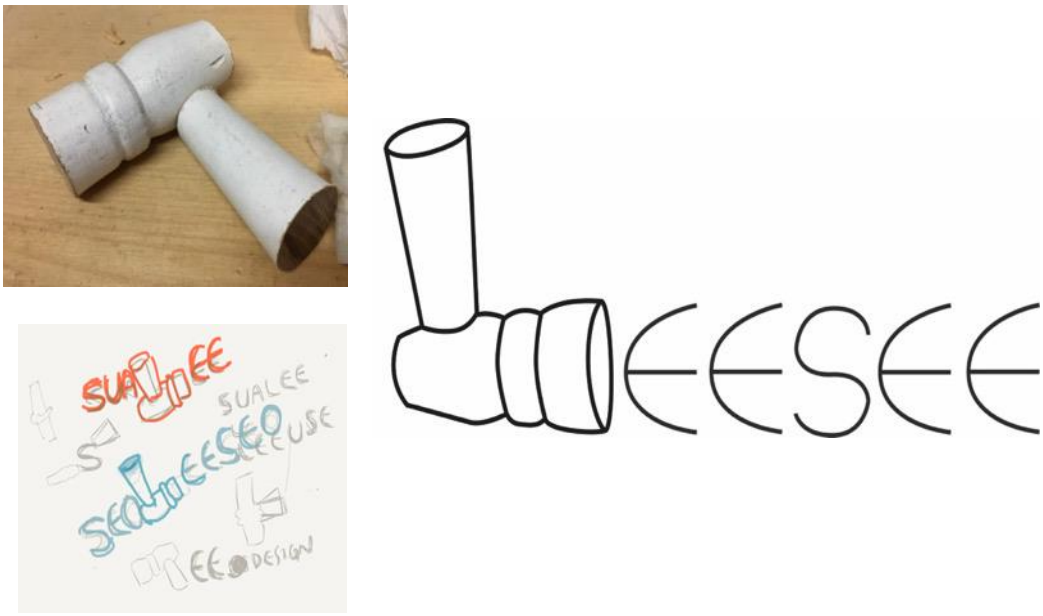

Figure 131 – Establishing brand (top), inspirational part made from waste material, (bottom) logo design sketch

6.8 Summary of chapter

The reason for neglecting the use of waste materials is that they are difficult to handle as they have the limit of their shape and there is not a constant supply for repeatable production. However, through the design development and production, this chapter has found that there is a way to solve the problem: seeing the material and its usability through improvisation or materialisation. This way, although the waste materials come in various sizes and irregular shapes, there is a continued supply for repeat orders. Through the design progress, the waste materials' versatility has been increased by utilising the offcuts from one design to create another. For example, one discarded dining chair with turned legs can produce at least three candelabra, two door wedges,

two coat racks and two ring holders, which are the design outcomes from this practical experiment.

Reducing lead time and cost in production and design development has been employed as a central strategy for this series of practice-led tests. The starting point of the design has been assessed from pricing to producing, not the other way around, which is a more standard design and manufacture procedure. Most companies postpone pricing decisions until *after* the product is developed, hoping they will make money rather than knowing they will (Ramanujam and Kucher, 2018).

To further improve the design efficiency, a period of design development attempted to make five products within two months as an experiment, and after the design development, the production time was calculated. Furthermore, to minimise the product cost, the packaging is considered at the beginning of the plan to make the right decision on the products' maximum dimension.

> Packaging is everything. Even if your piece is horrible, but wrapped nicely, it will sell (Hutching, 2017).

Sam Hutching from *sam agus nessa* (second brand of Furniture Magpies, Chapter 5) believes that its sales have increased because of the packaging (Figure 72). For commercial products, packaging is almost obligatory, not just for attraction via retailing, but also for convenient and safe transportation. Approaching this in an environmentally friendly way for this practice is vital, so finding ideal wrapping for the products has been considered in existing packaging shapes that also respect the ethos of adhocism, using existing materials that are to hand.

As the majority of furniture waste is timber, reusing it is the best way (see Chapter 2) to apply commercial value to it as it has flexibility for making articles and this is possible though low cost and low resource creative design processes. This way, it not only helps to prevent waste, but also reduces landfill, which the survey shows is desired by the public for the sake of the environment. Regarding this aspect, the former makers' artistry is preserved and its embodied energy can be saved one more time before it ends up in landfill. As with most designers and makers, evaluating one's own design aesthetics within a limited environment in a cost-effective way is what this practice is trying to achieve. Even though this practice seeks efficiency through production, an attractive design is a fundamental outcome, and this can be easily missed when pursuing sustainable design.

> Many consider great design and green design to be separate pursuits and in fact much of what is touted as "green" is not easy on the eyes. The ugly truth about sustainable design is that much of it is ugly (Hosey, 2012, p.2).

Lance Hosey, an architect, stated in *The Shape of Green* (2012) that many green designs are often associated with being ugly, which is clearly unnecessary. Looking for beauty is a natural behaviour for humans, so presenting this allure along with an environmental consideration is what must be done by designers. The results from the survey confirm this, showing clearly that people are attracted by appearance and creativeness, not by 'greenism'. Occasionally, a denial reaction was observed by the public when people recognised that the materials used for the commodity were from waste (during the commercial show by the Furniture Magpies). Generally, the word

‘waste’ indicates unpleasant, useless, cheap, rubbish, valueless or unobtrusive, and if people think the product is showing the origin of the waste, it seems to remind them of this, which leads to hesitation in obtaining it. Waste is considered as ugliness itself, so perhaps disguising the visibility of its origin would improve its desirability, and this has been used as another central strategy in this practice.
Several fundamental methods have been adopted as procedures in this practical design development, which have derived from the following aspects of this study:

- Using furniture waste by reviewing the current waste issue with a site visit and literature
- Ad-hoc and reuse inspiration by reviewing historical designs with a sustainable focus within literature
- Assessing customer needs by collecting and analysing the data from the survey and exhibitions
- Identifying the characteristic designs and the efficiency of current similar design businesses by interviewing the designers themselves.

The practical experiment of this research has focused on reusing elements of furniture waste as a primary material, and finding its new function has been the motivation for the design development.
This chapter has explored the rationale of the study through practice and has explained the perspective on decision-making while the products are developing and the reason for design decisions. Five products, FM coat rack, Stuck door wedge, Build Up Light, Ad hoc candelabra and Arti ring holder, have been developed to show how an actual series of furniture waste has been employed in the production by using a creative mind. Three main works, *Thinking Through Craft* (Adamson, 2007), *The Craftsman* (Sennett, 2008) and *The Shape of Green* (Hosey, 2012), have been used to support the reason for the design decision-making during the development of the products.
As the designer intended to create primitive pieces that combine the joyfulness of play, the waste materials were explored to create a new interpretation and the audience were invited to become part of the journey. What the research finding has predominantly applied to its design is divided into three categories.

1. Design aesthetics

   A design practice has been developed based on a heterogeneous approach to existing sustainable products through discarded objects and their subsequent deconstruction. Revealing the beauty by reusing waste materials has been experimented with through the making process, improvisation, and adapting users’ opinions. This has led to the production of visually attractive designs that are proportionally balanced and maximised the colour contrast of the materials for visual impact. Material begins to take on a shape of its own accord (Adamson, 2007, p.63) and the form of the pieces has been followed spontaneously. Based on the survey findings, the perception of the public has been enhanced by adding a surface finish treatment to the products. All the products have focused on delivering a smooth tactile finish or a new component, for example, brass and copper have been adapted to meet consumers’ desires.

2. Time efficiency

   This has been the vital approach to the practice as the products are not gallery pieces, but for users. Reducing the production time has been achieved through the design development by sharing the production procedure for material pre-preparation and following the standardised production strategy. Moreover, considering marketing of the products at the beginning stage of the idea sketch improved its efficiency.

3. Sustainability

   The main consideration in addition to the design aesthetics and time efficiency for the practice is that the procedure has to be as environmentally friendly as possible through the decision-making on the raw material choice, making process, and wrapping design. To promote the sustainable use of the material, reutilising waste materials and repurposing existing materials to hand are mostly applied unless new materials are required by regulations. Furthermore, the offcuts after use of the waste materials were reassessed and experimented with to create a new product. For the production, hand tools and hand machinery have been used in the majority of cases, and the duplication of making sets for various products was maximised to reduce the energy consumption.

These three approaches to the design has resulted in the development of products that could attract audiences and possibly be profitable for the business. Moreover, they perhaps can help to reduce waste by attempting to diminish waste to landfill and finding another purpose for the material waste while producing another useful product.

Chapter 7. Conclusion

Design for the Real World by Papanek (1972) outlines the author's belief that designers are wasting their skills on imprudent jobs instead of doing the genuine work required to make the world a better place:

> The only important thing about design is how it relates to people (Papanek, 1985)

The book argues that designers are required to possess high social and moral responsibility and that their work fundamentally entices people to increase consumption. Their responsibility is not to encourage expenditure but, rather, to encourage people to make better decisions for themselves and for the places where they reside.

Throughout the years, several attempts have been made by artists to educate the public on environmental problems through artwork. For example, a visually eye-catching photograph – 'Mermaids Hate Plastic' (Figure 132) – created by Benjamin Von Wong with 10,000 used plastic bottles was recently spread by the public through social networks and received 1.5 million hits per day (Wallis, 2016). This piece of work, which is responding to statements such as 'more plastic than fish in the sea by 2050'(Von Wong, 2018), is meant to share an ordinary, boring issue in an extraordinary way in order to give the public an effective message regarding environmental issues. This type of artwork increases people's awareness of the waste issue and the need for a solution.

> that designers can directly influence the decision people make about what they buy and why (Bhamra and Lofthouse, 2007, p.38)

In addition to the topic of how artwork increases awareness, this study investigated current environmental issues and discussed how designers can apply positive suggestions for such problems through design practices that illustrate practicality and adaptability to consumers.

Figure 132 – 'Mermaids Hate Plastic' by Benjamin Von Wong, ©Von Wong

7.1 Analysis of Findings/Evaluation of Aims

The core aims of this research are to create alternative design processes for small design practitioners and businesses that uses waste material in a sustainable manner, to produce an environmental business framework that could encourage more young designers to follow this course of action by reducing the existing waste that goes to landfills, transforming waste into products with commercial value, and encouraging material reuse. To evaluate the aims, the following central research objectives (in bullet points) were involved in this study and their findings were inspected:

- To understand the broader implications and importance of green issues and explore the key issues and systems of furniture waste management in order to investigate the current state and availability of waste and its relevance to waste reuse design

Global environmental issues have become more accepted by the public since the 1960s due to Carson's (1962) warnings of the danger of DDT. Now, research has shown that global warming and climate change have occurred because of the greenhouse effect, which is a direct result of human activity (i.e. Anthropocene) and natural events. Even worse, our current progress requires far too many natural resources for energy, and this is gradually destroying the planet. As stated in a 2011 report by UNEP, the energy supply, industry/manufacturing, and forestry sectors account for over 60% of all greenhouse gas (GHG) emissions. The forestry sector contributes to this primarily through worldwide deforestation, as trees are cut down to clear space for agriculture and other land uses and not enough are left to absorb carbon dioxide. Also, when burned or left to rot, trees emit the carbon dioxide stored in their trunks and leaves (UNEP,2011, p.24). There is no way of stopping this greed for land, so deforestation will continue creating greater problems. The fundamental problem, i.e. the desire for land, needs to be solved by developing a substitute for land or by finding other ways to maximise the use of already-cut trees rather than cut down more trees.

Over the last century, humanity's impact upon the natural world has been significant, as the global economy has demanded more resources to increase development. We are all collectively responsible for the future and for the future generations that will inherit this planet. To solve the environmental crisis, many regulations, policies, and agreements have been established between countries, and the Reduce, Reuse and Recycle (3R) Campaign seems to be well known by the public.

There is little in the way of practical advice to help adults deal with these ecological issues at the individual or family levels. Ecological processing methods like LCA are enforced in macro units to build up the minimum capacity of waste, but, still, it is impossible to generate zero waste. Though the waste produced by manufacturing is only a small amount, it is still a problem that needs to be dealt with.

In comparison to furniture waste, other types of waste have been organised within their own systems for environmental damage control. For instance, the automobile waste industries have structured their own circular arrangement of recycling, and this cycle means that as little waste as possible is produced. Approximately 42% of bulky waste in the UK is comprised of furniture, but only 1/4 of this furniture is reused; this figure could be doubled if furniture could be saved for reuse with some slight repairs (WRAP, 2012, p.03). In terms of furniture waste, reuse is the best solution being

carried out in the UK. Attempts to encourage people to reuse items rather than dispose of them in landfills are often seen in such as charity shops, online markets like eBay and Facebook, Freecycle, and car boot sales. In most cases, the motivation is monetary and not out of environmental concern. However, re-consumption and reuse contribute to saving the planet. After a piece of furniture has lived again as a second-hand furniture (in the form of the original construction and use or function), it can sometimes not be fully working as it is, and this requires further and deeper consideration by designers to create alternative use for furniture waste before it goes to a landfill. To take advantage of a piece of furniture that has remained the previous life footage on its design and structure, as little energy as should be used to transform it to something else. That is, designers should intervene to provide better solutions when using waste materials via a greater understanding of environmental issues.

- To explore whether the trend of boosting environmental credentials has affected not only furniture and product design and production but also furniture buying habits and public perceptions

This research has considered the fact that no one can get away from environmental issues—especially not designers. Many designers are already implementing more sustainable production methods with a focus on sustainable materials and methods, e.g. system optimisation for furniture manufacturing, waste reuse for crafts, and material production by recycling waste. With so many designs being produced using waste materials and so-called green products, we might become complacent about the usefulness or integrity of the word, which requires substantial thoughtfulness. To a certain extent, it seems worthwhile to expose environmental topics, but without proper consideration, this approach only serves to persuade people to purchase yet another new product, introducing more 'things' into a world already saturated with products. George Monbiot called it 'eco-junk' (2007):

> Green consumerism is becoming a pox on the planet. If it merely swapped the damaging goods we buy for less damaging ones, I would champion it. But two parallel markets are developing: one for unethical products and one for ethical products, and the expansion of the second does little to hinder the growth of the first. I am now drowning in a tide of eco-junk. Over the past six months, our coat pegs have become clogged with organic cotton bags, which - filled with packets of ginseng tea and jojoba oil bath salts - are now the obligatory gift at every environmental event. I have several lifetimes' supply of ballpoint pens made with recycled paper and about half a dozen miniature solar chargers for gadgets I don't possess.

In recent years, environmental issues have had a huge impact on designers, and, when done well, the designers' work has been welcomed by consumers. Such well-considered and executed green design surely offers a positive way forward for contemporary design and will help save the planet in a very direct manner. The traditional definition of a well-designed product is one that performs its function successfully, is manufactured efficiently using appropriate materials and techniques,

is easy-to-use and safe, offers good value for money, and looks attractive. New definitions of good product design should include environmental considerations (Mackenzie, 1997, p. 68). The book *Green Design* (Mackenzie, 1997) discusses whether products have sustainable designs or not. The book displays pieces that are designed for an extended useful life, designs for re-manufacture or recyclability using recycled or recyclable materials, designs using biodegradable materials, and designs with a minimal use of resources. Countless intelligent and attractive designs have been created and have influenced people's perceptions on green design.

Arguably, many designers today are not prepared to translate these real environmental concerns into effective action. Sometimes, designers seem to jump on a bandwagon without fully understanding the process behind producing a legitimate piece of sustainable design. Often, after including only one element of green design, they will call a product an eco-friendly piece. They have simply adopted this strategy in a relatively cynical way.

Such strategies offer a useful way forward and might directly help save the planet. Regarding 'Reduce', production lines are employing more sustainable methods like LCA; regarding 'Reuse', many designers are creating furniture pieces with a focus on waste materials like pallets, construction pipes, and newspapers. Regarding 'Recycle', most furniture pieces are collected for recycling if their value can no longer be appreciated but can provide another use, such as animal bedding. The solution seems to lie with designers who interpret green issues through the transformation of ideas using rejected objects and then sublimate waste into beautiful and useful design. For example, Freitag and Elvis and Kresse used their designs to make abandoned waste re-loved by the public and showed the retail market's possibilities.

Consumers have grown accustomed to having not only what they need but also what they want. As such, when we buy and use things, we all need to take more responsibility for how our actions affect the environment. Regarding the necessity and willingness to purchase waste material using products, 90% of people answered positively through survey (please see chapter 4). A designer's job is also to guide consumers in the right direction in terms of consumerism. Design is often about understanding culture and context before we even know where to start with an idea (Brown, 2009). Once designers understand the real concerns of environmental issues, they will be able to lead other designers and consumers into effective action. A more sustainable approach for contemporary furniture and product design must be created.

> Design is an eternally evolving and changing force. There are endless developments in materials, techniques, and processes, not to mention new design trends and styles. The notion of integrating ecological awareness into design practices is becoming more of a concern and a necessity. Designers play a key role in the advancement of these practices because they are responsible for making the vital material and production decisions for consumer products. Designers are not only stylistic innovators, but also problem solvers (Brower and Mallory, 2005).

For designers, it is exasperating to remain conscious of sustainability and stay on the right track for environmental responsibility. However, once they are on the right path, designers can prove that their designs can convert consumerism to a more

sustainable route. Designers must be careful, as they have a powerful tool, i.e. design, that can have a huge impact on what consumers buy.

- To learn about design history from an environmental view, evaluate this view and capture its creative thinking, and inspire ideas that support practical design outcomes

A few design movements have been explored in order to learn and gain inspiration from design approaches throughout history, such as Postmodernism, Adhocism, Utility Furniture and 'make do and mend'. Although the designs of these times were not connected to any environmental considerations, some sustainable contents came out of them. In his book *Ting Tang Trash*, art historian Jorunn Veiteberg (2011) said in regard to ceramics that post-industrial trends stood out relevantly in the 2000s as a completely new trend in craft, though not new in a way that represented a break with the past. 'The past is present everywhere', and through this review of history, furniture was given an important aspect regarding the choice of materials and motifs as well as work methods and themes.
For example, during World War II, when the action of 'make do and mend' was suggested, every source was limited, and the public was forced to restrict the use of furniture, as well. Utility furniture was developed and produced to provide fully-functioning furniture of sound construction with an agreeable design and reasonable price. As such, utility furniture has become its own style by reducing the decorative articles of design, instead using simple designs with straight lines that reduce the use of raw materials and minimise waste during production. This is similar to the idea of eco-design in contemporary products, in which the designs are primarily developed to preserve the environment. In addition, 'make do and mend' arose from the need to be resourceful during material shortage during and after World War II. As it was used for economic advantage, it created the concept of reusing materials in an inventive way by altering them to repair and patch. This gave this study the impression that different ways of applying different materials can possibly create a unique style, like that of Réanim by the 5.5 Designers (Figure 24) in which the idea starts a new lease on life for damaged furniture. Like the restriction of the time influenced the design of the era by developing mending skills, Postmodernism and Adhocism were discussed for their attitudes to design, which resulted in the approach of contemporary sustainable design. Adhocism involves finding new uses for a material to create alternate functions from its original purpose, e.g. using chipped mugs as plant pots. As this approach uses existing materials, a designer's craftsmanship and understanding of the materials can become unique points of their products, which has been a main focus of this design practice, for example by transforming an ordinary utilitarian object, such as a copper plumbing pipe, to a new purpose such as a candle insert (Figure 116). Postmodernism entails rejecting boundaries between high and low forms of art and rejecting rigid genre distinctions. Thus, it emphasises the character of design and uses unusual objects to produce ordinary objects, e.g. transforming a shopping trolley into a chair. The philosophy of Postmodernism seems to oppose sustainability, as it requires additional processing, though changing unexpected materials to everyday life products has an environmentally-friendly sense to it.

From the review of three specific movements from the past with the viewpoint of sustainable design, the current sustainable approaches that this study can apply for its practical experiments are as follows:

- adhere to materials and production methods that are currently available
- observe people's behaviour and use extemporaneous ideas and readily-available materials to solve immediate problems
- use the majority of the material to lessen another source of new waste creation
- reuse every element and achieve maximum efficiency with minimal demand
- exaggerate the original form of the waste material for the uniqueness of design

Although the methods and reasons behind the products are not associated with an environmentally-friendly view, the outcomes have resulted in green and sustainable objects that display environmentally sensitivity even though the design approaches have been diverse. Thus, the approaches of current sustainably-concerned products have also been examined. Nowadays, designers have been developing new forms of sustainable materials such as 'Mycelium + Timber' (Figure 34) and 'Newspaper Wood'(Figure 35) or focusing on the reduction of energy consumption in an innovative way, such as by building furniture pieces using the packaging itself (Figure 37) and growing trees into furniture shapes (Figure 38). If there are products that have a similar concept of using waste material, limited to materials or waste furniture, the products are conceptual and focus on dominant visualisation as an exhibition piece, like Martino Gamper's '100 chairs in 100 days' (Figure 133), which reassembled used discarded and damaged chairs into poetic forms. The '100 chairs in 100 days' piece has improvised objects to create unexpected positive result in transforming limitations into elements of possibility like what previous designs in the history. 'The project was all about being creative, but within restrictions—being limited to materials at hand and the time available, with the requirement that each new chair be unique' (Martinogamper, 2018). However, this practice is about to be close to the public's environmentally-considered sense by adding commercial value.

Figure 133 – '100 chairs in 100 days' by Martino Gamper, Cromwell Place, 2007. © Martino Gamper's website

- To investigate how young contemporary furniture design companies in the UK employ environmentally friendly manufacturing; to explore their business concepts and problems and seek appropriate strategies for design practices

As this study focused on micro-sized start-ups that use waste materials for their products, five UK designers and design studios – DZ Design, Hendzel+Hunt, Furniture Magpies, Jay & Co., and Geoffrey Fisher – were interviewed. Their case studies were investigated to explore any business strengths and weaknesses that could be applicable to author's design practice. The similarities and differences discovered between the case studies have been divided into three categories: 1.) Business set-up and background; 2.) Design philosophy, process, and current works; 3.) Business management and its difficulties. All five design entities had difficulties in the beginning with aspects such as time management and finances and are still currently learning about methods of promotion, target markets, trading channels, routes of business expansion, channels and sources of funding, and future visions for business growth. The most common problem among the design entities is a lack of resources such as finances, time, workforce, and materials, all of which are closely linked to the smooth running of a business. According to research organisation Artquest,[43] 'for a creative business as a self-employed or micro business, a designer-maker needs some basic knowledge of marketing, accounting, financial and legal matters, tax issues and invoicing. Learning other practical skills such as negotiation and selling are vital'. All five case studies seems not been away from it, and some of them suggested that entrepreneurs get help if possible, as this makes the start less challenging. Some of the case studies started their business with waste materials due to financial issues and the fact that the individuality of the materials could be developed to add to the character of the designs through skilled technique and craftsmanship.

Of course, designers need craftsmanship, creative thinking, and production skills, as well. Examples of how the case studies have made their businesses stand out include the accurate and sophisticated joints by DZ Design and Hendzel+Hunt, the vibrant colour stress on simple upholstery by Jay & Co., and the transformation of abandoned waste materials to new functional products by Furniture Magpies and Geoffrey Fisher. The design entities also insisted on the importance of a comprehensive marketing package that includes a narrative, labelling, images, retail casing, delivery modes and methods, and pricing. Many of them also use social media as their main form of communication and promotion, but the key aspect to consider for appropriate marketing is to know the right target.

What this research noted from the case studies is that having one's own firm requires a significant commitment and spontaneous management in all aspects in order to devise an accurate target and strategy with the right pricing and grasp the financial condition, scale, and ability of the business. If any young entrepreneurs are interested in opening their own studio like the author of this research, efficiency in every single

[43] Research organisation that, since 2001, has studied visual artists' working conditions, career barriers, and motivations to develop professional information, advice, and projects that they need. It works in partnership with NPOs, SSOs, and the wider arts sector to deliver programmes that support the sustainability of visual artists. Retrieved from Art council England, 2018

step is the core to making a business successful, as learned from these case studies compare to the writer's few painful previous experiences from Furniture Magpies. During the interviews, all the studied design entities advised young entrepreneurs to have endurance and also included the following advice:

- N. Doran O'Reilly (Furniture Magpies): 'Perseverance (2017).'
- Hunt (Hendzel+Hunt): 'Don't give up, don't give up really, would be the main thing (2013).'
- J. Blade (Jay & Co.): 'You need to be physically ready for that, and mentally (2016).'
- G. Fisher (Geoffrey Fisher): 'You just have to be persistent (2017).'
- R. Zakss (DZ Design): 'Keep it up, it's a long process (2013).'

To promote the advantage of the upcycling sector business, obtaining free or inexpensive materials as ingredients for production to reduce their companies' running costs could be a good starting point for young entrepreneurs. Moreover, actions such as rescuing wood destined to be thrown into landfills could be sustainable for the planet. However, as stated by the interviewees, the disadvantages of using waste materials include longer processing times and the difficulty of repeating the products due to the limitations of discarded objects, which are restricted by size, quality, and quantity. Thus, this study focused on reutilising waste materials in their original forms because re-usage requires less energy than producing virgin materials does and also reduces the sizes of landfills more than recycling.

- To experiment through design practice by using the research findings to develop a design process in order to discover the reason behind the absence of products made from repurposed waste materials and to encourage more artists to this course of action

We learn from what people have done previously (i.e. history) and fix the mistakes from these previous attempts. As a designer, the study author questioned whether environmentally safer practices are possible as an individual. Even though we as designers and makers try to keep our work as ecological as possible in everything we do, we have not yet found a way to be completely environmentally friendly (zero waste possibility). This has still influenced the design process, though, as it is always important to produce as little waste as possible during manufacturing.
Inspired by the findings from the contextual history review (e.g. do not be biased by environmental priority in design but maintain various perspectives on the design approach) and the case studies (e.g. be both craft-minded and business-minded), five designs were developed: FM Coatrack (Figure 97); Stuck Door Wedge (Figure 104); Build Up Lamp (Figure 113); Ad-hoc Candelabra (Figure 119) and Arti Ring Holder Figure 128). These products are examples of the eclectic proposal of this study, adapting the need for small products with retail packaging and reflecting the trend colour through investigation such as copper. However, all five products have their own character from the authenticity of their materials. These five objects are mainly tied to traditional materials, e.g. solid wooden chairs and tables that have unique figures. This is not only because environmental concerns encompassed all aspects of the reuse but also because the impression of the products' lines attracted the designer, as this type of furniture was not popular during the designer's childhood due to cultural

differences. Moreover, the reason behind the material choice is that timber is an easily-accessible material found in everyday objects that doesn't require complicated tools, which could be a plus factor for start-ups. Material consumption is driven by complex motivations and is about far more than just acquisition of newer, shiner things. It is an endless personal journey toward the ideal or desired self that, by its very nature, becomes a process of incremental destruction (Chapman, 2006, p.53).

Discarded furniture was the designer's main consideration for the products, and the key aspect of furniture waste material is that the material itself has been structurally formed from its previous function and shape. This is unlike other raw materials in board or plank form as it has idiosyncratic features that depend on the form and function of the furniture. This practice was a testament to the strength, value, and enduring nature of furniture and the repurposing liveliness of its original form to new role as a designer. This was workable even though the furniture waste or parts were not structurally strong enough to be adapted for a capable function, as products are required to be useful. What this research found throughout its practical experiment stage (especially with the furniture waste materials during the design improvisation) is that a successful business is possible if its products apply discoveries from focus groups (see page 78) and case studies (see page 123). Decreasing production time by increasing the material compatibility between products with a clever design and aesthetic appearance within an acceptable market price is the answer. The idea of completely rethinking, deconstructing, and reworking pre-owned furniture served to substantialise the design aesthetic and brought the validity of the materials to light.

> Hand vs. head, materiality vs. language, skill vs. concept: there are plenty of ways to put craft in its place (Adamson, 2009).

When this practice stands at the crossroads of decision-making, the exposure of the beauty inside (e.g. sections, grains, colours from a previous life) through craft with appreciation is advocated as a main design concept. The practical experiment also attempted to focus on the organic unity of the integral work of design by sharing same procedure and materials until the stage of assembling point. Throughout this practice, incidental time in production can be saved substantially, as highlighted from the case studies as a business firm. Maximising the production processes between the five products was possible through a procedure that has been repeatedly applied to other experimental products. To illustrate this in detail:

1) The first three steps of production, i.e. dismantling and cleaning the old furniture and cutting it into the desired length (even in off-cuts are possible to use), could be shared for all five products
2) Marking the centre for 10mm drilling was a standard procedure for ring holders, coat rack hooks, and lighting
3) Planning procedures are common for candelabras, coatrack bodies, and door wedges
4) Sanding the entire product line

As in the details above, creating a standard for the measurement and production processes of the waste materials using the right tools is indispensable for increasing the production amount.

Hence, a lot of energy and time can be saved during the preparation aspect of production by dividing per process instead of starting and finishing each item

individually. This may sound no different than contemporary manufacture nowadays, wherein the labour is divided to increase efficiency. However, this is a practice that has proven that the use of waste materials is applicable with an efficient process despite the difficulty of repeating the products due to the limitations of discarded objects, which has probably been the reason for the absence of products using waste materials. Thus, the practical result of this study has espoused the aspects of it and developed with concentrating efficiency as a commodity, but with agreeable design appearance. Additionally, like Geoffrey Fisher stated (see chapter 5.5), who influenced this study the most as the outcomes are aimed for UK retailers, preparing attractive, quality packaging is principal for business marketing, Geoffrey Fisher insisted. The process of developing a design starts from considering the packaging, sketching ideas, and evaluating the materials without disturbing the original design forms.

7.1.1 Model for practice

From author's personal perspective, design is future-oriented, so comprehending the events of the present and reflecting them in design properly is imperative. Using fewer or recycled materials during production still inevitably creates rubbish, which means that waste will never be extinct. Where does the responsibility lie, and how can we ameliorate the effect on future generations? This study attempted to answer these questions by suggesting a way to alter the wastage of products and materials. In order to meet safety regulations, we have to use new materials, some of which are not always are as 'green' as we would like. Even in situations in which we require no additional materials, we still need labour and machinery (which cause carbon emissions), glues that are not always 'green', and transport to both collect and deliver our pieces. However, focusing on minimising waste (although this has to include all aforementioned facts) is the key for individuals where is accessible stage to help for the environment.

> Don't overdesign. A simple, well-thought-through, authentic design is often the best. Everything doesn't need to be redesigned; sometimes what we have in hand is better than what we seek. It's not all about being different; it's about being better (Hill, 2012).

In regard to designing and creating with furniture waste through creative thinking and with commercial validity, this study suggested a model of practice, briefly introducing it so as to make the process clear to practitioners:

- Consider: always keep in mind that it is a business, and do not underestimate finances and time for designing and creating. Try to improve the process to minimise limitations through creative thinking.
- Collect: design practitioners should separate the waste into relevant categories like colours, shapes, patterns, material contents, etc.
- Recognise: prepare a presentation of the product – including branding and packaging – beforehand to see its capabilities and limitations.
- Sketch: draw design ideas/brainstorm to analyse the discard properties and to identify matchable materials to use, and develop the design by gaining inspiration from the collected waste.

- Simplify: cut the collected materials into smaller pieces to make them ready for use, and categorise the process of making by material and divide the material by the process
- Standardise: once the discards have been sorted into categories in the Sketch and Process steps, this stage involves becoming efficient in production by applying a manufacturing system that includes processes such as using templates for set measurements, sharing tools to increase compatibility, and dividing the production line by making not by individual product
- Generate: combine the final concept of design by categorised materials, and develop details for delivering the product.

7.2 Contributions to Knowledge

With regard to design practice, many contemporary, environmentally-concerned designs – specifically those using recycled or upcycled materials as a main material – that join existing or discarded pieces together can create unexpected positive results, such as Martino Gamper's work (Figure 133). However, no significant literature or design practices have been found focusing on reusing waste furniture unless it is refurbished with paint or restored with upholstery, especially for individual designers or micro design businesses. Perhaps this practice has not been successful as sales have not been tested, however, in relation to the field of environmentally concerned design, it still can be argued that the practical experiment has fulfilled its aim of suggesting alternative craft approaches reusing waste furniture for a complete new product with a view of commercial value. Although the individual knowledge is not completely new, the package of guidance is new for designers within profit-oriented businesses, especially focusing on young start-ups using furniture waste.

In practice-based research based on a specific material – in this case, furniture waste – new ground can be broken concerning specific design approaches, improvisation, and the subversion of materials in their original forms. For example, the materials suggest new functions with their form and making starts by dividing the original form into smaller pieces to be ready as raw materials. Design decisions are made around the materiality, functionality and repeatability, and consideration of the knowledge of consumers' wants and needs (such as not seeing the negative connotations of waste) without losing creativity and innovation (to show the positives of the waste materials). The aim of this research is to develop a model which can provide practical advice to help young designers deal with environmental issues via design and materials reuse. This study functions as an articulation of the research journey, providing a discursive platform for dialogue and review and facilitating new insights into a creative practice that contributes to new knowledge by efficiently crafting objects in a commercial context using discarded materials. It proves that this form of waste can be adapted as a primary material for upcycling into commercial products in repeated production runs. This research does not reveal new production processes or techniques, but its practical experiments highlighted the expressive aesthetic potential of waste furniture materials for small design groups. The design development was process-driven and linked by objects and experimentation following each different material shape.

Concerning the contextual aspect, the knowledge of consumer wants and the case studies arguably contribute the most to the field's development. This study investigated consumer perceptions of the waste materials used in products,

accessing the knowledge of what they want and making this available to designers. Aesthetic attraction and 'cleverness' or innovation of waste appropriation were the key quoted purchase drivers, proving that there is a potential commercial market for the waste in reused, upcycled products. To reach the goals of environmental sustainability and responsibility as a designer while still producing designs that are loved and desired by consumers, this study proposed that there needs to be a place for unfettered creativity that will enable designers to embrace the value of discarded objects. This new knowledge discovered in this study was demonstrated through product creation in the design practice and the practice has addressed both ideas, creativity and commercial validity, to inspire more designers to consider using and environmentally friendly production approach with subsequent benefits for the environment as a whole and a greater awareness of material reuse in the future.

7.3 Further Research

The author of this research believes that expanding the market base for products that embrace waste materials by increasing the consumption mentality through creative design is a form of designers' responsibility towards the environment. The waste issue is becoming a more significant problem as time passes. In July 2017, China announced plans to ban imports of 24 grades of rubbish, reducing the amount of the world's waste it imports to feed its recycling industry (BBC, 2017). This means that managing waste within the UK is unescapable, so there needs to be an alternative solution. As such, this study searched for a design-oriented solution by suggesting alternative uses for the waste through craft and creativity. The findings of this study can perhaps contribute to another practitioner's environmental improvement measures, and the practical outcomes can be sampled for a better understanding of the model of practice.

An ongoing goal of this study was to change the paradigm of waste management in order to reduce the endless waste generated by designers and encourage the public's repossession of products using waste materials through creative thinking. Thus, further research on creating a paradigm shift towards furniture waste or other relevant waste is needed to create public awareness, just as with food waste or the 3R Campaign. For example, by reusing unwanted furniture before it goes to recycling in waste management, the furniture waste can be saved for reuse as a raw material and still have the opportunity to re-join the recycling circle. With this investigation's discoveries, designers can develop products by reusing existing waste. To help understand this cycle, an illustration has been created (Figure 134). However, it is still a hypothetical process and has not been fully articulated. Thus, any further investment in regard to changing the entire sustainable cycle can be publicised as a research option.

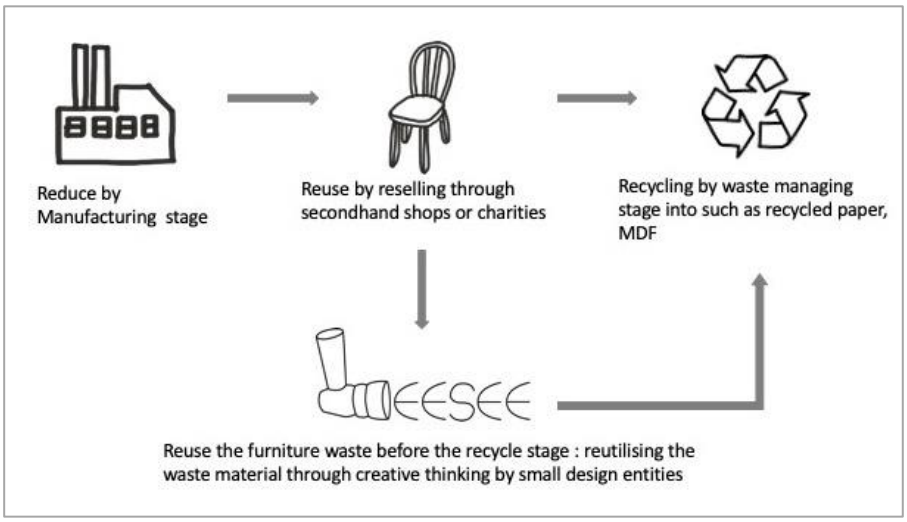

Figure 134 – An example of a new cycle for wooden waste (household waste)

The individual collection, sorting and re-making of furniture waste could grow to a more significant step by involving established mass-production furniture companies. For example, Swedish designer Marie Louise Hellgren is a testament to this process: her stool, 'Lilla Snåland' (Figure 135), in Tent London 2017 was made from offcuts that had been given from Swedish furniture company Stolab21 after its own production. Since the materials for Hellgren's stool were offcuts, she arranged the small pieces into one round seat, which is similar to this study's way of approaching assembly (see page 140). The issue for her stool was that it took seven years to convince the furniture company to cooperate.

Figure 135 – 'Lilla Snåland' by Marie-Louise Hellegren in cooperation with Stolab, London Design Festival, September 2017

Normally, for manufacturers, their production errors or offcuts are used as their energy source, which is the last stage of the waste hierarchy. Instead of using the leftovers as an energy source, providing them to a small business to create a new product

through reuse would be a better step for the environment in regard to the waste hierarchy, and consumers would pursue the product in appreciation for the re-value of the waste material (see chapter 2.2). However, building supply connections for furniture waste material between prominent companies and small businesses is not a simple, straightforward process, and further research is required for this to be viable and potentially beneficial.

Almost every past study on sustainable design has involved the development of systemised methods for large manufacturing firms (see chapter 2.3) and suggested what processes could contribute towards a better environment. However, this study offers new insights into a model for practice using furniture waste by combining design and business in order to encourage more young entrepreneurs to apply sustainability in their designs at lower market volumes. Further investigation is needed to prove the success of this approach regarding product manufacture using furniture waste in the current market, and to assess its viability within a range of commercial production systems for small design practices.

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Appendices

Appendix 1: Survey questionnaires (p.28, p77 and p.78)

VOTING SURVEY

Thank you for taking your time to help my research study.

Sua Lee, PhD research student at BNU E: slee01@bucks.ac.uk

Q1. Where are you originally from? UK□ Other Europe□ Korea□ Other Asia □ None of them□

Q1-1. Do you still live in that country? Yes□ No□

Q2. What is your gender? Male□ Female□ Other□

Q3.How old are you? Over 65 □ 46 – 65 □ 22 – 45 □ Under 22 □

Q4. How many of these words have you heard of:

Eco Design □ Environmentally friendly Design □ Sustainable Design □

Green Design □ Recycling □ Energy efficient Design □ Upcycling □

Q4-1. Do you agree that you should know the individual meaning above terms you have ticked?

Strongly agree□ Agree □ Neither Agree Nor disagree□ Disagree □ Strongly disagree□

Q5. **What** have you chosen your favourite design?

Crisps wallet□ Hair spray light□ Usefully Tangled□ Baked bean tin bracelet□ Margherita□

Scoop□ The cradle□ Porter drawer□ Tetra wall□ Casual society□ The inheritance of loss□

Q5-1. **Why** have you chosen your favourite design?

It's clever □ It's funny □ It's beautiful □ It's green □ Not obviously recycled □

Q5-2. For your chosen design, would you prefer to:

Make it yourself □ Buy it □ Neither of those □

Q6. If you answered, "Buy it" to Q5-2, how would you rate the price of up-cycled products compared to brand new products using raw material?

A lot cheaper □ Fairly cheaper□ Similar□ Fairly more expensive□ A lot more expensive□

Q6-1. How much would you like to pay for your chosen product?

£5-10 □ £11-20 □ £21-30□ £31- 40 □ £41-50 □ over £50□

Finally,

Q7. Should we stop the production of waste at source, or should we recycle?

If you would like to help me further, please leave your contact details.

Appendix 2: Brief of Beautiful Waste (p.28 and p.78)

vitra.

NSF National School of Furniture

MA Furniture Design
Bucks New University

Introductory Project 1, February 2012

Beautiful Waste

You are Charles Eames. You are 105 years old. You are still designing. Vitra have asked you to produce a small model of your latest design, to be displayed at their London showroom from 28th – 1st March 2012.

You are increasingly frustrated by the sheer volumes and **quality** of waste packaging generated today. You find it absurd. You design something, not to sell necessarily, but to inspire people to buy less stuff and to inspire manufacturers to think twice about what they produce. It must be made primarily of, or be inspired by,waste packaging and must function as well as, or better than, a new version of the designed object.

The model you make and exhibit (after having experimented with many) must be the actual final piece full size (1:1), and must not exceed 250mm in any direction.

It must be **EXQUISITELY** made. It must be '**BEAUTIFUL**' as justifiable by you, the designer.

Appendix 3: Questionnaires for the case study (p.29 and p.89)

1. When and how did you set up your own business? (Have got any research background for your business?) Why did you set up in this geographical location?
2. People call what you do Upcyling. What do you think about it? Do you agree to this term? Or would you like to call it something else, eg. Eco, Green, sustainable etc.?
3. What do you think of those terms? When was the first time heard those terms?
4. It seems green issues are the trend and are used a lot for marketing and promotion. What do you think about this? Do you think this helped your business to grow?
5. Who are your main clients and how they are approached? Are they Individuals or retailers?
6. Why do you think people love your design?
7. What are the main difficulties of running your business? (Funding? Running Costs? Capital Costs? Cashflow?)
8. Do you do marketing? What is your main marketing tool? Is marketing important for an SmE business like you?
9. Where do you get your materials? Any particular sources? Or any trouble with lack of sourcing?
10. What is the main consideration when you design a new piece? Are you concerned about how your design will be received?
11. What is your favourite piece and why?
12. Do you do exhibitions? If you do how many times a year?
13. Why do you choose the exhibitions you exhibit at?
14. What feedback do you normally get from the public?
15. What do you think is the biggest problem for SmE businesses in this area? Do you know any other small design groups for environmentally friendly design? Are there competitors you can think of?
16. Have you done any events with children before? If so, why? How did children find about it? Would you like to do events with children if not?
17. Where do you see your business in the future?

Appendix 4: Inventory of Carbon & Energy (ICE) Summery Table_ Version 1.6a (p.52)

The Inventory of Carbon & Energy (ICE) – Main Data Tables

INVENTORY OF CARBON & ENERGY (ICE) SUMMARY

Materials	Embodied Energy & Carbon Data						Comments
	EE - MJ/kg			EC - kgCO2/Kg			EE = Embodied Energy, EC = Embodied Carbon
Aggregate							
General	0.1			0.005			
Aluminium							
General	155			8.24			13.8 MJ/kg Feedstock Energy (Included). Assumes UK ratio of 25.6% extrusions, 55.7% Rolled & 18.7% castings. Worldwide recycled content of 33%.
Virgin	218			11.46			20.7 MJ/kg Feedstock Energy (Included)
Recycled	28.8			1.69			
Cast Products	159			8.28			14.3 MJ/kg Feedstock Energy (Included). Worldwide recycled content of 33%.
Virgin	226			11.70			21.3 MJ/kg Feedstock Energy (Included)
Recycled	24.5			1.35			
Extruded	154			8.16			13.6 MJ/kg Feedstock Energy (Included). Worldwide recycled content of 33%.
Virgin	214			11.20			20.2 MJ/kg Feedstock Energy (Included)
Recycled	34.1			1.98			
Rolled	155			8.26			13.8 MJ/kg Feedstock Energy (Included). Worldwide recycled content of 33%.
Virgin	217			11.50			20.6 MJ/kg Feedstock Energy (Included)
Recycled	27.8			1.67			
Asphalt							
General	2.60			0.045			1.91 MJ/kg Feedstock Energy (Included)
Road & Pavement	2.41			0.14			0.82 MJ/kg Feedstock Energy (Included), reference 123
EXAMPLE: Road	2,672 MJ/Sqm			134 KgCO2/Sqm			906 MJ/Sqm Feedstock Energy (Included)
Bitumen							
General	47			0.48			37.7 (?) MJ/kg Feedstock Energy (Included). Feedstock taken as typical energy content of Bitumen, uncertain carbon dioxide emissions
Brass							
General	44.00			2.42 (?)			poor data availability, largely dependent upon ore grade. Very poor carbon data, uncertain of estimates, which were taken from average quoted emissions per MJ energy
Virgin	80.00			4.39 (?)			
Recycled	20.00			1.1 (?)			
Bricks							
General (Common Brick)	3.00			0.22			
EXAMPLE: Single Brick	8.4 MJ per brick			0.62 kgCO2 per brick			Assuming 2.8 kg per brick
Facing Bricks	8.20			0.52			Very small sample size
EXAMPLE: Single Facing Brick	23 MJ per brick			1.46 kgCO2 per brick			Assuming 2.8 kg per brick
Limestone	0.85			?			
Bronze							
General	77.00			4.1 (?)			Reference 155
Carpet							
General Carpet	74.40			3.89			For per square meter see material profile
Felt (Hair and Jute) Underlay	18.60			0.96			Reference 77
Nylon	67.9 to 149			3.55 to 7.31			Very difficult to select value, few sources, large range, value includes feedstock's
Polyethylterepthalate (PET)	106.50			5.55			includes feedstock's
Polypropylene	95.40			5.03			includes feedstock's, for per square meter see material profile
Polyurethane	72.10			3.76			includes feedstock's
Rubber	67.5 to 140			3.91 to 8.11			
Saturated Felt Underlay (impregnated with Asphalt or tar)	31.70			1.70			Reference 77
Wool	106.00			5.48			For per square meter see material profile, References 57,166 & 234
Cement							
General (Typical)	4.6			0.83			Portland Cement, CEM I
Fibre Cement	10.90			2.11			
Mortar (1:3 cement:sand mix)	1.40			0.213			Values estimated from the ICE Cement, Mortar & Concrete Model
Mortar (1:4)	1.21			0.177			
Mortar (1:6)	0.99			0.136			
Mortar (1:½:4½ Cement:Lime:Sand mix)	1.37			0.196			
Mortar (1:1:6 Cement:Lime:Sand mix)	1.18			0.163			
Mortar (1:2:9 Cement:Lime:Sand mix)	1.09			0.143			
Soil-Cement	0.85			0.14			
% Cementitious Replacement	0%	25%	50%	0%	25%	50%	Note 0% is a 'standard' CEM I cement
General (with Fly Ash Replacement)	4.6	3.52	2.43	0.83	0.62	0.42	Portland Cement
General (with Blast Furnace Slag Replacement)	4.6	3.81	3.01	0.83	0.64	0.45	Portland Cement

INVENTORY OF CARBON & ENERGY (ICE) SUMMARY

Materials	Embodied Energy & Carbon Data						Comments
	EE - MJ/kg			EC - kgCO2/Kg			EE = Embodied Energy, EC = Embodied Carbon
Ceramics							
General	10.00			0.65			Very Large data range, difficult to select best value
Fittings	20.00			1.05			Reference 1
Refractory products	5.50			0.51			
Sanitary Products	29.00			1.48			
Tile	9.00			0.59			Very large data range
Clay							
General (Simple Baked Products)	3.00			0.22			General simple baked clay products (inc. terracotta)
Tile	6.50			0.46			
Vitrified clay pipe DN 100 & DN 150	6.19			0.45			
Vitrified clay pipe DN 200 & DN 300	7.03			0.49			
Vitrified clay pipe DN 500	7.86			0.53			
Concrete							
General	0.95			0.130			Use of a specific concrete specification is preferred to gain greater accuracy.
NOMINAL PROPORTIONS METHOD (Volume), Proportions from BS 8500:2006 (ICE Cement, Mortar & Concrete Model Calculations)							
1:1:2 Cement:Sand:Aggregate	1.39			0.209			(High strength)
1:1.5:3	1.11			0.159			(used in floor slab, columns & load bearing structure)
1:2:4	0.95			0.129			(Typical in construction of buildings under 3 storeys)
1:2.5:5	0.84			0.109			
1:3:6	0.77			0.096			(non-structural mass concrete)
1:4:8	0.69			0.080			
REINFORCED CONCRETE							
For reinforcement add to selected coefficient for each 25kg rebar	0.26			0.018			Add for each 25 kg Steel per m3 concrete
EXAMPLE: Reinforced RC30 (below)	2.12 (1.09 + 0.26 * 4)			0.241 (0.153 + 0.018 * 4)			
CONCRETE BLOCKS (ICE CMC Model Values)							
Block - 8 MPa Compressive Strength	0.60			0.061			Estimated from concrete block mix proportions.
Block - 10 MPa	0.67			0.074			
Block -12 MPa	0.71			0.080			
Block -13 MPa	0.81			0.098			
Autoclaved Aerated Blocks (AAC's)	3.50			0.28 to 0.375			Not ICE CMC model results
MISCELLANEOUS VALUES							
Prefabricated Concrete	2.00			0.215			Literature resources suggest this value, unknown why so high!
Fibre-Reinforced	7.75			0.450			
Concrete Road & Pavement	1.24			0.127			
EXAMPLE Road	2,085 MJ/Sqm			187.7 KgCO2/Sqm			
Wood-Wool Reinforced	2.08			-			Reference 12
% Cement Replacement - Fly Ash	0%	25%	50%	0%	25%	50%	Note 0% is a standard concrete
GEN 0	0.64	0.57	0.50	0.071	0.058	0.046	Compressive Strength C6/8 MPa
GEN 1	0.77	0.66	0.56	0.095	0.077	0.059	C8/10; Mass Concrete, mass fill, mass foundations
GEN 2	0.81	0.70	0.58	0.103	0.083	0.062	C12/15
GEN 3	0.85	0.73	0.60	0.112	0.089	0.066	C16/20
RC20	0.95	0.80	0.65	0.128	0.102	0.075	C20/25
RC25	0.99	0.83	0.67	0.136	0.108	0.079	C25/30
RC30	1.08	0.90	0.72	0.153	0.120	0.087	C30/37; (Strong) foundations
RC35	1.13	0.94	0.74	0.161	0.126	0.091	C35/45; Ground floors
RC40	1.17	0.97	0.77	0.169	0.132	0.096	C40/50; Structural purposes, in situ floors, walls, superstructure
RC50	1.41	1.15	0.88	0.212	0.165	0.117	C50
PAV1	1.04	0.87	0.70	0.145	0.114	0.083	C25/30
PAV2	1.08	0.90	0.72	0.153	0.120	0.087	C28/35
% Cement Replacement - Blast Furnace Slag	0%	25%	50%	0%	25%	50%	Note 0% is a standard concrete
GEN 0	0.64	0.59	0.54	0.071	0.059	0.048	Compressive Strength C6/8 MPa
GEN 1	0.77	0.69	0.62	0.095	0.078	0.061	C8/10; Mass Concrete, mass fill, mass foundations
GEN 2	0.81	0.70	0.65	0.103	0.083	0.065	C12/15
GEN 3	0.85	0.76	0.67	0.112	0.091	0.070	C16/20
RC20	0.95	0.84	0.73	0.128	0.103	0.079	C20/25
RC25	0.99	0.88	0.76	0.136	0.110	0.083	C25/30
RC30	1.08	0.95	0.82	0.153	0.122	0.092	C30/37; (Strong) foundations
RC35	1.13	0.99	0.85	0.161	0.129	0.096	C35/45; Ground floors
RC40	1.17	1.03	0.88	0.169	0.135	0.101	C40/50; Structural purposes, in situ floors, walls, superstructure
RC50	1.41	1.22	1.03	0.212	0.168	0.124	C50
PAV1	1.04	0.91	0.79	0.145	0.116	0.088	C25/30
PAV2	1.08	0.95	0.82	0.153	0.122	0.092	C28/35
COMMENTS							
The first column represents standard concrete, created with 100% Portland cement. The other columns are estimates based on a direct substitution of fly ash or blast furnace slag in place of the cement content. The ICE Cement, Mortar & Concrete Model was applied. It was assumed that there will be no changes in the quantities of water, aggregates or plasticiser/additives due to the use of cementitious replacement materials.							

INVENTORY OF CARBON & ENERGY (ICE) SUMMARY

Materials	Embodied Energy & Carbon Data		Comments
	EE - MJ/kg	EC - kgCO2/Kg	EE = Embodied Energy, EC = Embodied Carbon
Copper			
General	40 to 55	2.19 to 3.83 (?)	Conflicting data, possibly due to large variations in ore grade. Assumes recycled materials of 46%. See material profiles for further details
Virgin	70 (?)	3.83 (?)	Large data range, very difficult to select possibly due to large variations in ore grade and therefore embodied energy and carbon.
Recycled from high grade scrap	17.5 (?)	0.96 (?)	
Recycled from low grade scrap	50 (?)	2.75 (?)	
Glass			
General	15.00	0.85	Poor data availability on recycled glass. Virgin Glass releases 0.185 Kg CO2 during production processes (Additional to energy emissions) this has been factored in (Fact taken from British Glass). Recycling rate from British glass report towards sustainable development 2004, difficult to select embodied carbon
Fibreglass (Glasswool)	28.00	1.53	
Toughened	23.50	1.27	Only three data sources
Insulation			
General Insulation	45.00	1.86	Estimated from typical market shares, Feedstock Energy 16.5 MJ/kg (Included)
Cellular Glass	27.00	-	Reference 48
Cellulose	0.94 to 3.3	-	
Cork	4.00	0.19	Reference 49
Fibreglass (Glasswool)	28.00	1.35	Poor data difficult to select appropriate value
Flax (Insulation)	39.50	1.70	Reference 2, 5.97 MJ/kg Feedstock Energy (Included)
Mineral wool	16.60	1.20	
Rockwool (stonewool)	16.80	1.05	
Paper wool	20.17	0.63	Reference 2
Polystyrene	See Plastics	See Plastics	see plastics
Polyurethane	See Plastics	See Plastics	see plastics
Woodwool (loose)	10.80	-	Reference 168
Woodwool (Board)	20.00	0.98	Reference 49
Wool (Recycled)	20.90	-	References 57,166 & 234
Iron			
General	25.00	1.91 (?)	Uncertain
Lead			
General	25.00	1.33	Allocated (divided) on a mass basis, assumes recycling rate of 61.5%
Virgin	49.00	2.61	
Recycled	10.00	0.53	
Virgin if produced with zinc	13.6 to 23.6	0.72 to 1.25	Allocated by system expansion (i.e. energy contributable to zinc by other processes)
Lime			
General	5.30	0.74	Embodied carbon was difficult to estimate
Linoleum			
General	25.00	1.21	Data difficult to select, large data range
Miscellaneous			
Asbestos	7.40	-	Reference 4
Calcium Silicate Sheet	2.00	0.13	Reference 49
Chromium	83	5.39	Reference 21
Cotton, Padding	27.10	1.28	Reference 34
Cotton, Fabric	143	6.78	Reference 34
Damp Proof Course/Membrane	134	4.20	
Felt General	36	-	
Flax	33.50	1.70	Reference 2
Fly Ash	0.10	0.01	
Grit	0.12	0.01	Reference 92
Carpet Grout	30.80	-	Reference 139
Glass Reinforced Plastic - GRP - Fibreglass	100	8.10	Reference 1
Lithium	853	5.30	Reference 92
Mandolite	63	1.40	Reference 1
Mineral Fibre Tile (Roofing)	37	2.70	Reference 1
Manganese	52	3.50	Reference 21
Mercury	87	4.94	Reference 21
Molybedenum	378	30.30	Reference 21
Nickel	164	12.40	Reference 92
Perlite - Expanded	10.00	0.52	Reference 92
Perlite - Natural	0.66	0.03	Reference 92
Quartz powder	0.85	0.02	Reference 92
Shingle	11.30	0.30	Reference 62
Silicon	2355	-	Reference 138
Slag (GGBS)	1.33	0.07	Ground Granulated Blast Furnace Slag (GGBS)
Silver	128.20	6.31	Reference 124
Straw	0.24	0.01	References 57,166 & 234
Terrazzo Tiles	1.40	0.12	Reference 1
Vanadium	3710.00	228.00	Reference 21
Vermiculite - Expanded	7.20	0.52	Reference 92
Vermiculite - Natural	0.72	0.03	Reference 92
Vicuclad	70.00	-	Reference 1

INVENTORY OF CARBON & ENERGY (ICE) SUMMARY

Materials	Embodied Energy & Carbon Data		Comments
	EE - MJ/kg	EC - kgCO2/Kg	EE = Embodied Energy, EC = Embodied Carbon
Water	0.20	-	Reference 139
Wax	52.00	-	Reference 139
Wood stain/Varnish	50.00	5.35	Reference 1
General Wool	3.00	0.15	Reference 155
Yttrium	1470	84.00	Reference 21
Zirconium	1610	97.20	Reference 21
Paint			
General	68.00	3.56	Large variations in data, especially for carbon emissions.
EXAMPLE: Single Coat	10.2 MJ/Sqm	0.53 kgCO2/Sqm	Assuming 6.66 Sqm Coverage per kg
EXAMPLE: Double Coat	20.4 MJ/Sqm	1.06 kgCO2/Sqm	Assuming 3.33 Sqm Coverage per kg
EXAMPLE: Triple Coat	30.6 MJ/Sqm	1.60 kgCO2/Sqm	Assuming 2.22 Sqm Coverage per kg
Paper			
Paperboard (General for construction use)	24.80	1.32	Excluding CV of wood, excludes carbon sequestration
Fine Paper	28.20	1.50	Excluding CV of wood, excludes carbon sequestration
Wallpaper	36.40	1.93	
Plaster			
General (Gypsum)	1.80	0.12	Problems selecting good value, inconsistent figures, West et al believe this is because of past aggregation of EE with cement
Plasterboard	6.75	0.38	
Plastics			
General	80.50	2.53	35.6 MJ/kg Feedstock Energy (Included). Determined by the average use of each type of plastic used in the European construction industry
ABS	95.30	3.10	48.6 MJ/kg Feedstock Energy (Included)
General Polyethylene	83.10	1.94	54.4 MJ/kg Feedstock Energy (Included). Based on average use of types of PE in European construction
High Density Polyethylene (HDPE)	76.70	1.60	54.3 MJ/kg Feedstock Energy (Included)
HDPE Pipe	84.40	2.00	55.1 MJ/kg Feedstock Energy (Included)
Low Density Polyethylene (LDPE)	78.10	1.70	51.6 MJ/kg Feedstock Energy (Included)
LDPE Film	89.30	1.90	55.2 MJ/kg Feedstock Energy (Included)
Nylon 6	120.50	5.50	38.6 MJ/kg Feedstock Energy (Included)
Nylon 6,6	138.60	6.50	50.7 MJ/kg Feedstock Energy (Included)
Polycarbonate	112.90	6.00	36.7 MJ/kg Feedstock Energy (Included)
Polypropylene, Orientated Film	99.20	2.70	55.7 MJ/kg Feedstock Energy (Included)
Polypropylene, Injection Moulding	115.10	3.90	54 MJ/kg Feedstock Energy (Included)
Expanded Polystyrene	88.60	2.50	46.2 MJ/kg Feedstock Energy (Included)
General Purpose Polystyrene	86.40	2.70	46.3 MJ/kg Feedstock Energy (Included)
High Impact Polystyrene	87.40	2.80	46.4 MJ/kg Feedstock Energy (Included)
Thermoformed Expanded Polystyrene	109.20	3.40	49.7 MJ/kg Feedstock Energy (Included)
Polyurethane	72.10	3.00	34.67 MJ/kg Feedstock Energy (Included). Poor data availability of feedstock energy
PVC General	77.20	2.41	28.1 MJ/kg Feedstock Energy (Included). Assumed market average use of types of PVC in the European construction industry
PVC Pipe	67.50	2.50	24.4 MJ/kg Feedstock Energy (Included)
Calendered Sheet PVC	68.60	2.60	24.4 MJ/kg Feedstock Energy (Included)
PVC Injection Moulding	95.10	2.20	35.1 MJ/kg Feedstock Energy (Included)
UPVC Film	69.40	2.50	25.3 MJ/kg Feedstock Energy (Included)
Rubber			
General	101.70	3.18	41.1 MJ/kg Feedstock Energy (Included). Assumes that natural rubber accounts for 35% of market. Difficult to estimate carbon emissions.
Synthetic rubber	120.00	4.02	42 MJ/kg Feedstock Energy (Included). Difficult to estimate carbon emissions.
Natural latex rubber	67.60	1.63	39.43 MJ/kg Feedstock Energy (Included). Feedstock from the production of carbon black. Difficult to estimate carbon emissions.
Sand			
General	0.10	0.005	
Sealants and adhesives			
Epoxide Resin	139.30	5.91	42.6 MJ/kg Feedstock Energy (Included)
Mastic Sealant	62.3 to 200	-	
Melamine Resin	113.00	-	Reference 77
Phenol Formaldehyde	87 to 89.3	-	
Urea Formaldehyde	40 to 78.2	1.3 to 2.26	
Soil			
General (Rammed Soil)	0.45	0.023	

INVENTORY OF CARBON & ENERGY (ICE) SUMMARY

Materials	Embodied Energy & Carbon Data		Comments
	EE - MJ/kg	EC - kgCO2/Kg	EE = Embodied Energy, EC = Embodied Carbon
Steel			
General (average of all steels)	24.40	1.77	Estimated from UK mix of materials. Worldwide recycled content of 42.7%
Virgin	35.30	2.75	
Recycled	9.50	0.43	Could not collect strong statistics on mix of recycled steels
Bar & rod	24.60	1.71	Recycled content 42.7%
Virgin	36.40	2.68	
Recycled	8.80	0.42	
Engineering steel - Recycled	13.10	0.68	
Pipe - Virgin	34.44	2.70	
Recycled	Not Typical Production Route		
Plate - Virgin	48.40	3.19	
Recycled	Not Typical Production Route		
Section	25.40	1.78	Recycled content 42.7%
Virgin	36.80	2.78	
Recycled	10.00	0.44	
Sheet - Virgin	31.50	2.51	
Recycled	Not Typical Production Route		
Sheet - Galvanised - Virgin	39.00	2.82	
Wire - Virgin	36.00	2.83	
Stainless	56.70	6.15	4.3 MJ/kg Feedstock Energy (Included). This data has been difficult to select, there is highly conflicting data, finally selected world average data from institute of Stainless Steel Forum (ISSF) due to the large extent of the study. Values specified are for the most popular grade (304)
Stone	Data on stone was difficult to select, with high standard deviations and data ranges.		
General	1.00	0.056	
Stone Gravel/Chippings	0.30	0.017	
Granite	0.1 to 13.9 !	0.006 to 0.781	Reference 22
Limestone	0.30	0.017	
Marble	2.00	0.112	
Marble tile	3.33	0.187	
Shale	0.03	0.002	Reference 36
Slate	0.1 to 1.0	0.006 to 0.056	Large data range
Timber	All timber values exclude the Calorific Value (CV) of wood. Timber values were particularly difficult to select!		
General	8.50	0.46	Estimated from UK consumption of timber
Glue Laminated timber	12.00	0.65 (?)	
Hardboard	16.00	0.86	
Laminated Veneer Lumber	9.50	0.51 (?)	Ref 126
MDF	11.00	0.59	Only 4 data sources
Particle Board	9.50	0.51	Very large data range, difficult to select best value
Plywood	15.00	0.81	
Sawn Hardwood	7.80	0.47	
Sawn Softwood	7.40	0.45	
Veneer Particleboard (Furniture)	23.00	1.24	
Tin			
Tin Coated Plate (Steel)	19.2 to 54.7	1.03 to 2.93	
Tin	250.00	13.70	lack of modern data, large range of data
Titanium			
Virgin	361 to 745	-	lack of modern data, large range of data, small sample size
Recycled	258.00	-	lack of modern data, large range of data, small sample size
Vinyl Flooring			
General	65.64	2.29	23.58 MJ/kg Feedstock Energy (Included), Same value as PVC calendered sheet
Vinyl Composite Tiles (VCT)	13.70	-	Reference 77
Zinc			
General	61.90	3.31	uncertain carbon estimates, currently estimated from typical fuel mix
Virgin	72.00	3.86	
Recycled	9.00	0.48	

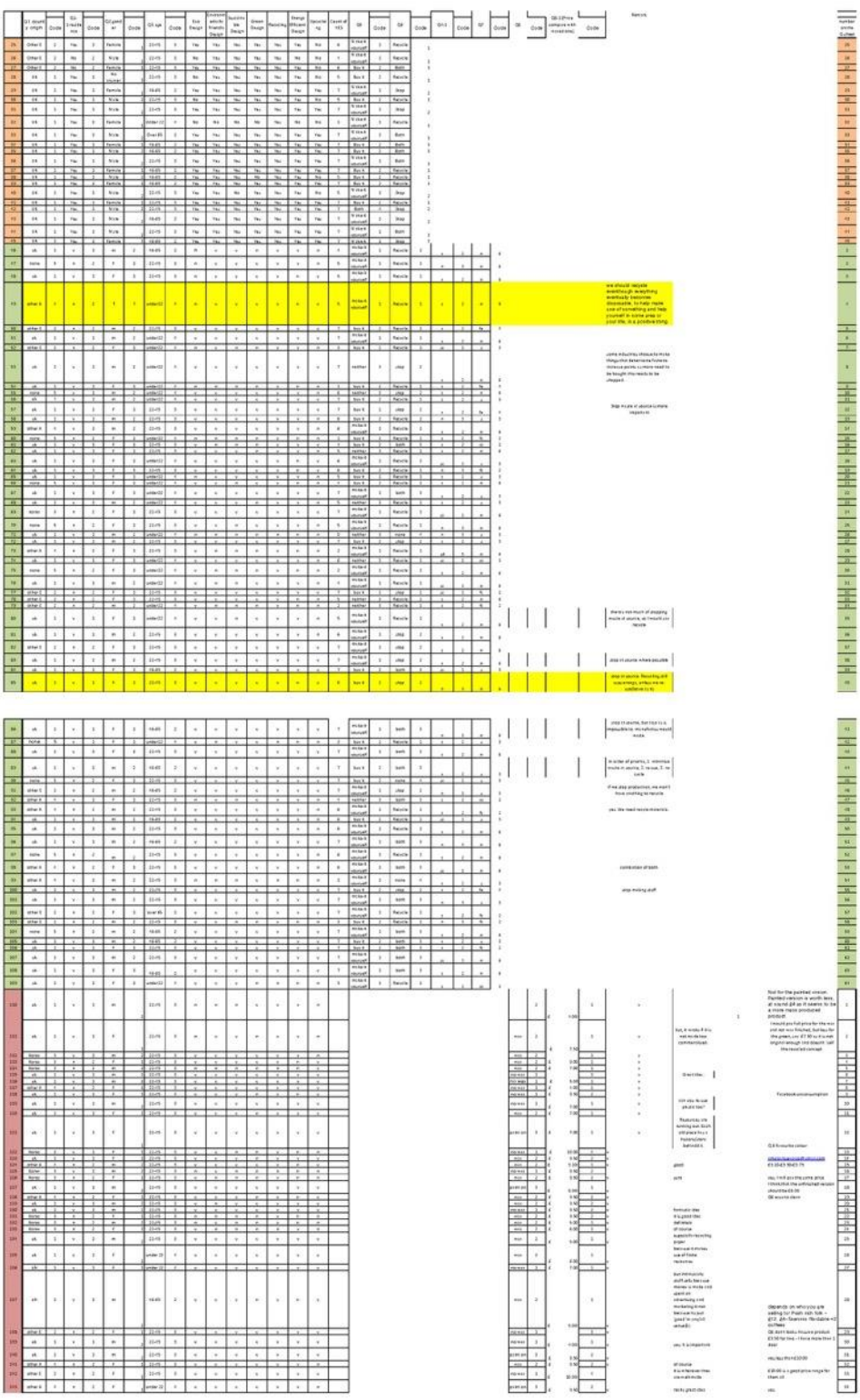
INVENTORY OF CARBON & ENERGY (ICE) SUMMARY

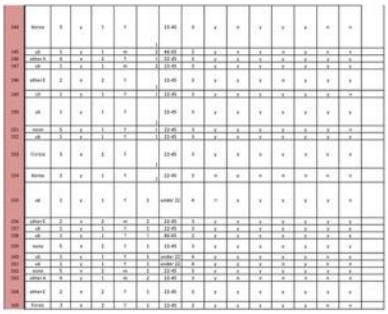
Materials	Embodied Energy & Carbon Data		Comments
	EE - MJ/kg	EC - kgCO2/Kg	EE = Embodied Energy, EC = Embodied Carbon

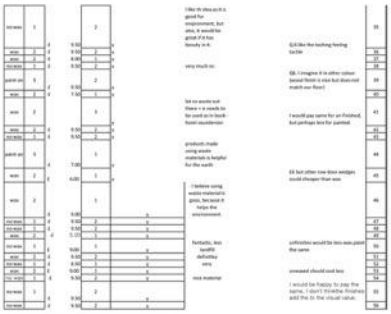
Miscellaneous:

	Embodied Energy - MJ	Embodied Carbon - Kg CO2	
PV Modules	MJ/sqm	Kg CO2/sqm	
Monocrystalline	4750 (2590 to 8640)	242 (132 to 440)	Assumed typical industrial fuel mix to estimate CO2
Polycrystalline	4070 (1945 to 5660)	208 (99 to 289)	
ThinFilm	1305 (775 to 1805)	67 (40 to 92)	
Windows	MJ per Window		
1.2mx1.2m Single Glazed Timber Framed Unit	286 ?	14.60	Assumed typical UK industrial fuel mix to estimate CO2
1.2mx1.2m Double Glazed (Air or Argon Filled):	–	--	–
Aluminium Framed	5470	279	
PVC Framed	2150 to 2470	110 to 126	
Aluminium -Clad Timber Framed	950 to 1460	48 to 75	
Timber Framed	230 to 490	12 to 25	
Krypton Filled Add:	510	26	
Xenon Filled Add:	4500	229	

Appendix 5: Data collection and analysis by Microsoft Excel (p.79)







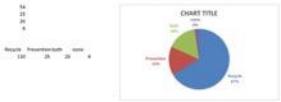

54
23
24
4
Recycle
130
Prevention both
25
20
none
4

CHART TITLE

Cross Q1 & Q2

	female	male	no answer	
UK	46	48	1	95
Other EU	11	11	0	22
Korea	10	4	0	14
Other Asia	10	7	0	17
None	12	5	0	17
	89	75	1	
			165	165

Cross Q1 -Q2

Under 22	22-45	46-65	Over 65
29	109	25	2

165

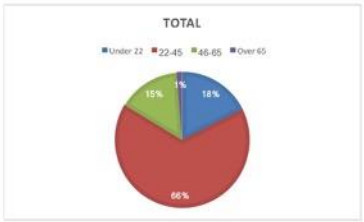
	under22	22-45	46-65	over65	
female	20	58	10	1	89
Male	9	50	15	1	75
no answer	0	1	0	0	1
					165

UK residance by sex & age

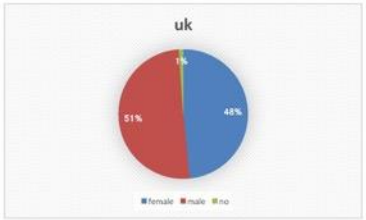
	under22	22-45	46-56	over65	
female	13	23	10	0	46
Male	6	30	11	1	48
no answer	0	1	0	0	1
					95

UK residance by age

age group	Under 22	22-45	46-65	Over 65	
	19	54	21	1	95



	female	male	no
uk	46	48	1



	ounty orig	Code	Q2.gender	Code	Q3.age	Code
1	UK	1	Female	1	22-45	3
2	UK	1	Male	2	22-45	3
3	UK	1	Female	1	22-45	3
4	UK	1	Male	2	22-45	3
5	UK	1	Female	1	22-45	3
6	UK	1	Male	2	46-65	2
7	UK	1	Male	2	22-45	3
8	UK	1	Female	1	22-45	3
9	UK	1	Male	2	22-45	3
10	UK	1	Male	2	22-45	3
11	UK	1	Female	1	46-65	2
12	UK	1	Female	1	22-45	3
13	None	5	Female	1	22-45	3
14	None	5	Female	1	22-45	3
15	None	5	Male	2	22-45	3
16	None	5	Female	1	22-45	3
17	Other A	4	Male	2	46-65	2
18	Other A	4	Female	1	22-45	3
19	Other A	4	Male	2	22-45	3
20	Other E	2	Male	2	22-45	3
21	Other E	2	Male	2	46-65	2
22	Other E	2	Male	2	22-45	3
23	Other E	2	Male	2	Under 22	4
24	Other E	2	Male	2	22-45	3
25	Other E	2	Female	1	22-45	3
26	Other E	2	Male	2	22-45	3
27	Other E	2	Female	1	22-45	3
28	UK	1	No answer	3	22-45	3
29	UK	1	Female	1	46-65	2
30	UK	1	Male	2	22-45	3
31	UK	1	Male	2	22-45	3
32	UK	1	Female	1	Under 22	4
33	UK	1	Male	2	Over 65	1
34	UK	1	Female	1	46-65	2
35	UK	1	Male	2	46-65	2
36	UK	1	Male	2	22-45	3
37	UK	1	Female	1	46-65	2
38	UK	1	Male	2	46-65	2
39	UK	1	Female	1	46-65	2
40	UK	1	Male	2	22-45	3
41	UK	1	Female	1	22-45	3
42	UK	1	Male	2	22-45	3
43	UK	1	Male	2	46-65	2
44	UK	1	Male	2	22-45	3
45	UK	1	Female	1	46-65	2
46	uk	1	m	2	46-65	2
47	none	5	f	1	22-45	3
48	uk	1	f	1	22-45	3
49	other A	4	f	1	under22	4
50	other E	2	m	2	22-45	3
51	uk	1	m	2	under22	4
52	other E	2	f	1	under22	4
53	uk	1	m	2	under22	4
54	uk	1	f	1	under22	4
55	none	5	m	2	under22	4
56	uk	1	m	2	under22	4
57	uk	1	f	1	22-45	3
58	uk	1	m	2	22-45	3
59	other A	4	m	2	22-45	3
60	none	5	f	1	under22	4
61	uk	1	f	1	22-45	3
62	uk	1	f	1	22-45	3
63	uk	1	f	1	under22	4
64	uk	1	f	1	22-45	3
65	uk	1	f	1	under22	4
66	none	5	f	1	under22	4
67	uk	1	f	1	under22	4
68	uk	1	m	2	under22	4
69	korea	3	f	1	22-45	3
70	none	5	f	1	22-45	3
71	uk	1	m	2	under22	4
72	uk	1	m	2	22-45	3
73	other A	4	f	1	22-45	3
74	uk	1	f	1	under22	4
75	none	5	f	1	under22	4
76	uk	1	m	2	under22	4
77	other E	2	f	1	22-45	3
78	other E	2	f	1	22-45	3
79	other E	2	m	2	under22	4
80	uk	1	f	1	under22	4
81	uk	1	m	2	22-45	3
82	other E	2	f	1	22-45	3

83	uk	1	m	2	22-45	3
84	uk	1	f	1	46-65	2
85	uk	1	f	1	22-45	3
86	uk	1	f	1	46-65	2
87	none	5	f	1	under22	4
88	uk	1	f	1	22-45	3
89	uk	1	m	2	46-65	2
90	none	5	f	1	22-45	3
91	other E	2	m	2	46-65	2
92	other A	4	f	1	22-45	3
93	other A	4	m	2	22-45	3
94	uk	1	m	2	46-65	2
95	uk	1	m	2	22-45	3
96	uk	1	m	2	46-65	2
97	none	5	m	2	22-45	3
98	other A	4	f	1	22-45	3
99	other A	4	m	2	22-45	3
100	uk	1	m	2	22-45	3
101	uk	1	m	2	22-45	3
102	other E	2	f	1	over 65	1
103	other E	2	m	2	22-45	3
104	none	5	m	2	46-65	2
105	uk	1	m	2	46-65	2
106	uk	1	f	1	22-45	3
107	uk	1	m	2	22-45	3
108	uk	1	f	1	46-65	2
109	uk	1	f	1	under22	4
110	uk	1	m	2	22-45	3
111	uk	1	f	1	22-45	3
112	Korea	3	m	2	22-45	3
113	Korea	3	f	1	22-45	3
114	Korea	3	m	2	22-45	3
115	uk	1	m	2	22-45	3
116	uk	1	m	2	22-45	3
117	other A	4	f	1	22-45	3
118	uk	1	f	1	22-45	3
119	uk	1	m	2	22-45	3
120	uk	1	f	1	22-45	3
121	uk	1	f	1	22-45	3
122	Korea	3	f	1	22-45	3
123	uk	1	f	1	22-45	3
124	other A	4	m	2	22-45	3
125	Korea	3	m	2	22-45	3
126	Korea	3	f	1	22-45	3
127	uk	1	m	2	22-45	3
128	other A	4	f	1	22-45	3
129	uk	1	m	2	22-45	3
130	uk	1	m	2	22-45	3
131	Korea	3	f	1	22-45	3
132	Korea	3	m	2	22-45	3
133	Korea	3	f	1	22-45	3
134	uk	1	m	2	22-45	3
135	uk	1	f	1	under 22	4
136	uk	1	f	1	under 22	4
137	uk	1	m	2	46-65	2
138	other E	2	f	1	22-45	3
139	uk	1	m	2	22-45	3
140	uk	1	m	2	22-45	3
141	other A	4	f	1	22-45	3
142	other E	2	f	1	22-45	3
143	other A	4	f	1	under 22	4
144	Korea	3	f	1	22-45	3
145	uk	1	m	2	46-65	2
146	other A	4	f	1	22-45	3
147	uk	1	m	2	22-45	3
148	other E	2	f	1	22-45	3
149	uk	1	f	1	22-45	3
150	uk	1	f	1	22-45	3
151	none	5	f	1	22-45	3
152	uk	1	f	1	22-45	3
153	Korea	3	f	1	22-45	3
154	Korea	3	f	1	22-45	3
155	uk	1	f	1	under 22	4
156	other E	2	m	2	22-45	3
157	uk	1	f	1	22-45	3
158	uk	1	f	1	46-65	2
159	none	5	f	1	22-45	3
160	uk	1	f	1	under 22	4
161	uk	1	f	1	under 22	4
162	none	5	m	2	22-45	3
163	other A	4	m	2	22-45	3
164	other E	2	f	1	22-45	3
165	Korea	3	f	1	22-45	3

Q5 1. Design 2013	favour	Clever	Funny	Beautiful	Green	commcialli	easy to make	Q5-3. Price range					
								£5-10	£11-20	£21-30	£31-40	£41-50	over £50
Crispi wallet	5	3	1		1		1		3				
Hair spray light	7	2	1	4	1			2	1	2	2		2
Usefully-tangled	8	1		5	3			2	2	1			
Baked bean tie bracelet	6	2	1						2				
Margherita	43	34	5	3	1		1	8	9	2	1		
Scoop	2	1		2	1			1					
The Cradle	2			1							1		
Perler Drawer	1	1						1					
Tetra wall	3	2			1			1	2				
Casual Society	2	1						1	1				
The inheritance of loss	5	3		1	1			1	2				
	82	46	8	16	10	0	2	17	15	5	4	0	2
							82						

43

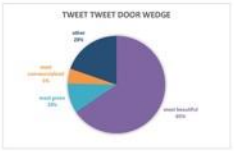
2012

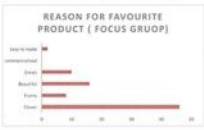
	total vote	1 Clever	2 Funny	3 Beautiful	4 Green	5 commersalised
Paola	9	1	4		1	
mike	3	1			2	1
Daryl	11		3	4		1
lo	7	1				
ester	3		1	3		
brian	5	1		2		
emilo	11	7	1	4		2
dennis	13	10		3	1	
	62	24	9	21	4	4

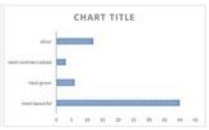
62

	most beautiful	most green	most commercialised	other
Tweet Tweet Door wedge	40	6	3	12

Clever	Funny	Beautiful	Green	commercials	easy to make
46	8	35	10	0	2







Q6 most green	Code	Q6 most beautiful	Code	Q6 commercial	Code	Q6 other	Code
n	2	y	1	y	1	y	1
n	2	y	1	n	2	n	2
n	2	n	2	n	2	y	1
n	2	y	1	n	2	n	2
n	2	y	1	n	2	n	2
n	2	y	1	n	2	n	2
n	2	y	1	n	2	n	2
n	2	y	1	n	2	n	2
n	2	n	2	n	2	y	1
n	2	n	2	n	2	y	1
n	2	y	1	n	2	n	2
n	2	y	1	n	2	n	2
n	2	y	1	n	2	n	2
y	1	n	2	n	2	n	2
n	2	y	1	n	2	n	2
n	2	y	1	n	2	n	2
n	2	y	1	n	2	n	2
y	1	n	2	n	2	n	2
n	2	y	1	n	2	n	2
n	2	n	2	n	2	y	1
n	2	y	1	n	2	n	2
n	2	y	1	n	2	n	2
n	2	n	2	n	2	y	1
n	2	n	2	n	2	y	1
n	2	y	1	n	2	n	2
n	2	y	1	n	2	n	2
n	2	n	2	n	2	y	1
n	2	n	2	n	2	y	1
n	2	n	2	n	2	n	2
y	1	y	1	n	2	n	2
n	2	y	1	n	2	n	2
y	1	n	2	n	2	n	2
n	2	y	1	n	2	n	2
n	2	y	1	n	2	n	2
n	2	y	1	n	2	n	2
n	2	y	1	n	2	n	2
n	2	y	1	n	2	n	2
n	2	y	1	n	2	n	2
n	2	y	1	n	2	n	2
y	1	n	2	n	2	n	2
y	1	y	1	n	2	n	2
n	2	y	1	n	2	n	2