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'Green Furniture'

Sustainable Design Guidelines for the Irish Furniture and Wood Products Industry

In One Volume

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DECLARATION OF ORIGINALITY

SEPTEMBER, 2010

The substance of this thesis is the original work of the author and due reference and acknowledgement has been made, when necessary, to the work of others. No part of this thesis has been accepted for any degree and is not concurrently submitted for any other award. I declare that this thesis is my original work except where otherwise stated.

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17/Sep/2010
_____

Date

Dedication

To my grandparents.

Summary

This thesis presents the research and development of sustainable design guidelines for the furniture and wood products industry, suitable for sustainably enhancing design, manufacturing and associated activities. This sustainable guideline is based on secondary research conducted on subject areas such as 'eco' design, 'green' branding and 'green' consumerism, as well as an examination of existing certifications and sustainable tools techniques and methodologies, national and international drivers for sustainable development and an overview of sustainability in the Irish furniture manufacturing context.

The guideline was further developed through primary research. This consisted of a focus group attended by leading Irish designers, manufacturers and academics in the area of furniture and wood products. This group explored the question of 'green branding' saturation in the market and the viability of investing in sustainability just yet. Participants stated that they felt the market for 'green' products is evolving very slowly and that there is no metric or legal framework present to audit whether or not companies are producing products that really embody sustainability. All the participants believed that developing and introducing a new certification process to incorporate a sustainable design process was a viable and necessary solution to protecting Irish furniture and wood manufacturers going forward. For the purposes of the case study, the author investigated a 'sustainable' design process for Teamwoodcraft, Ltd., through the design and development of a 'sustainable' children's furniture range. The case study followed a typical design and development process; detailing customer design specifications, concept development and refinement and cumulating in final prototype, as well as associated engineering drawings.

Based on this primary and secondary research, seven fundamental core principles for this sustainable guideline have been identified by the author. The author then used these core principles to expand into guidelines for the basis of proposed new Irish sustainable design guidelines for the furniture and wood products industry, the concept of which the author has named 'Green Dot'. The author suggests that the 'Green Dot' brand or logo could be used to market an umbrella network of Irish furniture designers and manufactures who implement the recommended sustainable techniques.

Acknowledgements

The author would like to sincerely express their gratitude to the following people who helped greatly in the research and completion of this thesis:

Table of contents

Glossary of abbreviations

BAT   Best Available Technology

BRE   Building Research Establishment

BSI   British Standards Institute

CNC   Computer numerical control

CSA   Canadian Standards Association

DEHLG   Department of Environment, Heritage & Local Government

ED's   External drivers

EIS   Environmental Impact Statement

EMS   Environmental Management System

EPA   Environmental Protection Agency

ETO   Engineered-to-order

FSC   Forest Stewardship Council

GSCM   Green supply chain management

GMIT   Galway-Mayo Institute of Technology

ID's   Internal drivers

IEA   International Energy Agency

IEP   International Energy Policy

IPCC   Intergovernmental Panel on Climate Change

I S   Irish Standard

ISO	International Organization for Standardisation
LCA	Life Cycle Analysis
MDF	Medium density fibreboard
MTO	Made-to-order
MTS	Made-to-stock
NPD	New product development
NSAI	National Standards Authority Ireland
PEFC	Programme for the Endorsement of Forest Certification
SEAI	Sustainable Energy Authority Ireland
SFI	Sustainable Forestry Initiative
TWC	Teamwoodcraft Ltd

Table of figures

Table of tables

Chapter 1: Introduction

1.1   Project background

In today's competitive markets, fast response to changes in styles and trends is important for furniture companies to compete and survive. In an industry that is constantly challenged by furniture that can be produced quickly and at low cost, Irish furniture companies need to maintain a constant awareness of what they are producing and how their products compare to market demand.

New product development (NPD) is vital in determining the ongoing economic success of manufacturing companies (RAHIM & BAKSH, P.25, 2003). Furniture companies must try to develop new products to satisfy the changing needs of the market as well as compete with other companies. An ability to speed up NPD is highly advantageous to a business, especially one that faces stiff competition within its particular market (RAHIM & BAKSH, P.25, 2003), such as the furniture and wood products industry. Improvements in the design and manufacture process will reduce lead time and lower manufacturing costs (RAHIM & BAKSH, P.25, 2003).

With the current economic recession, the development of 'sustainable' furniture and wood products as new markets has recently become a new market to explore for Irish manufacturers. In the last decade most Irish manufacturers have developed as project-based businesses heavily dependent on the construction (new-build and refurbishment) market. They have generally competed on the basis of quality, flexibility and reliability rather than price. With the collapse of the construction market, many manufacturers are looking for potential markets that value these competitive qualities. Therefore 'sustainable' products could be regarded as having a lot of potential for Irish manufacturers because customers are seen as less price-sensitive than in other areas of the market.

The purpose of the study is to conduct an investigation into sustainable or 'green' manufacture of Irish furniture and wood products in Ireland and to examine if sustainable design guidelines could be developed to meet Irish manufacturer's needs.

1.2   Aims and objectives

For this study, the author intends to research and propose a set of sustainable design guidelines for the furniture and wood products industry in Ireland. The aims and objectives of the study are:

1. To examine the current status of sustainability in the Irish furniture and wood products industry.

2. To investigate Irish manufacturers' attitude to incorporating 'green' design and if it is a viable option going forward.

3. To develop sustainable design guidelines for the incorporation of 'green' or sustainable design in the Irish furniture and wood products industry.

To achieve these aims and objectives, a number of sustainable design tools, metrics and certifications will be examined. Sustainable design guidelines, suitable for furniture and wood products will be developed based on this research. These guidelines will be informed on secondary research and also primary research: namely a focus group and also a case study of the design, development and manufacture of a range of eco-friendly children's furniture for an Irish joinery company.

1.3   Approach to work

The approach to work is depicted in figure 1 below, showing the process of how the author executed the research, leading to the development of sustainable design guidelines, conclusions and recommendations.
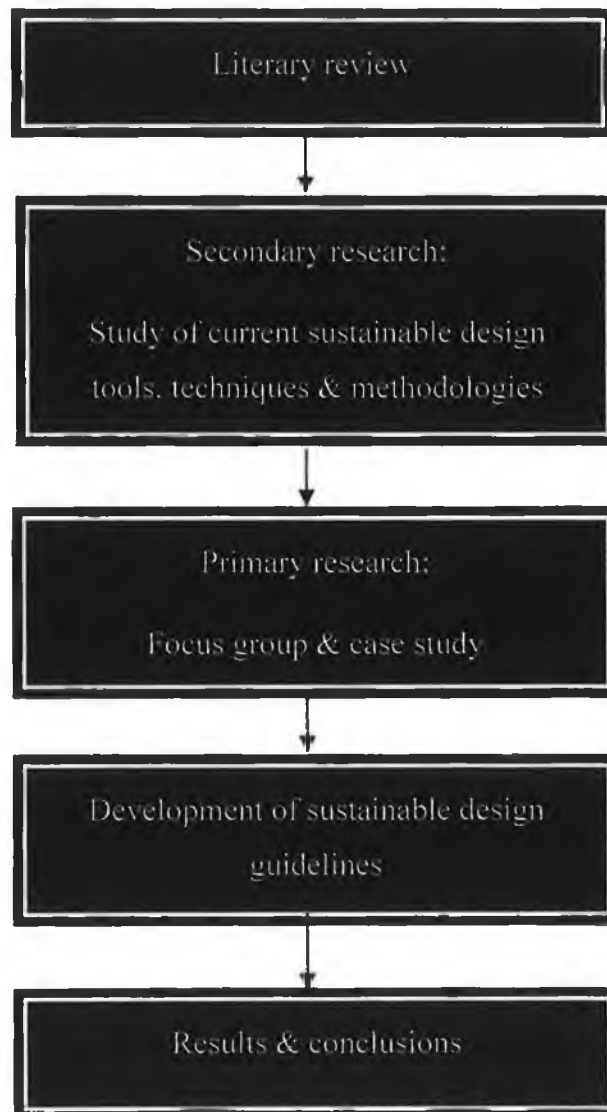
Figure 1 – Approach to work

Analysis of data is not an exact science (RAHIM & BAKSH, P.34, 2003), therefore the author investigated different types of quantitative and qualitative research methods to determine which method would be most fitting to the knowledge question. The results are detailed on the next page.

Quantitative versus qualitative research

The choice of indicators and evaluation techniques used in researching a topic depends to a large extent on what you want to investigate or ascertain from your piece of research (ALLISON ET AL, P.123, 1998).). The two main classifications of research are quantitative and qualitative research, which are explained below:

- ### *Quantitative research*

Quantitative research is the analysis of data which involves counting and identifying certain frequencies or patterns which emerge in the results (ALLISON ET AL, P.123, 1998). These patterns will be presented as the evidence for certain interpretations or conclusions (ALLISON ET AL, P.123, 1998).. This type of research would typically be used for analyzing various types of statistical data and would be represented by graphs and charts.

- ### *Qualitative research*

Qualitative research aims at a more observational account of a topic or issue (ALLISON ET AL, P.123, 1998). In this case, the recorded material will not necessarily be reduced to statistical patterns. Instead, the accounts or information given by interviewees will be 'combed through' for common themes or other points of significance (ALLISON ET AL, P.123, 1998).

Literary review

To create a basis for this study, the author studied a range of relevant books, journals, research papers and internet articles and websites. This was to gather a broad view on Irish furniture and wood product manufacturers, 'green' design, environmental certifications and the current financial and environmental status of the industry.

Secondary research

The author conducted a desk study of current sustainable design tools, techniques & methodologies. This involved examining different certifications and metrics that are used nationally and internationally. These certifications would be used as an example of how to develop sustainable design guidelines for the furniture and wood products industry.

Primary research

The primary research that was carried out involved a focus group, held at Enterprise Ireland in Dublin, and a case study of an Irish furniture company trying to implement a sustainably

designed range of children's furniture. The following outlines the rationale for choosing a focus group and a case study as primary research:

Focus groups as a qualitative research method

Only two decades ago, focus groups were almost unknown to social scientists (MORGAN, P.2, 1997). A recent review of online data bases indicates that research using focus groups is appearing in academic journals at the rate of more than 100 articles per year (MORGAN, P.2, 1997). Focus groups are an example of qualitative research.

Advantages of focus groups

The main advantages of focus groups in comparison to participant observation is the opportunity to observe a large amount of interaction on a topic within a limited period of time, based on the researcher's ability to assemble and direct the focus group session (MORGAN, P.8, 1997). This control can also be a disadvantage however, because it means that the focus groups are in some sense unnatural social settings. Three major advantages of naturalistic observation are: (1) an ability to collect data on a larger range of behaviours; (2) a greater variety of interactions with the study participants; and (3) a more open discussion of the research topic (MORGAN, P.8, 1997). By comparison, focus groups are: (1) limited to verbal behavior; (2) consist only of interaction in discussion groups; and (3) are created and managed by the researcher (MORGAN, P.8, 1997). Nonetheless, an advantage of a focus group as an interview technique lies in its ability to observe interaction on a topic (MORGAN, P.10, 1997). Group discussions provide direct evidence about similarities and differences in the participant's opinions and experiences as opposed to reaching such conclusions from post hoc analyses of separate statements from each interviewee (MORGAN, P.10, 1997).

It can be argued that the dynamics of individual interviews put more of a burden on the informants to explain themselves to the interviewer so that the elaboration of initial statements often occurs with relatively little input from the interviewer (MORGAN, P.11, 1997). The ability to give the group control over the direction of the interview is especially useful in exploratory research in which the researcher may not initially even know what questions to ask (MORGAN, P.11, 1997).

- ***Disadvantages of focus groups***

With focus groups, there is a concern that the facilitator - in the name of maintaining the interview's focus - will influence the group's interactions (MORGAN, P.11, 1997). . This problem is not unique to focus groups because the facilitator's impact on the data is not any greater than the researcher's impact in participant observation or individual interviewing (MORGAN, P.15, 1997). Another concern for focus groups include both a tendency toward conformity, in which some participants withhold things that they might say in private, and a tendency toward 'polarization', in which some participants express more extreme views in a group than in private (MORGAN, P.15, 1997).

Case studies as a qualitative research method

The case study method is a research tool – one of many techniques used to collect data and to build or validate new ones (RAHIM & BAKSH, P.27, 2003). A case study is an empirical inquiry that investigates a contemporary phenomenon within its real life context when the boundaries between phenomenon and context are not clearly evident (RAHIM & BAKSH, P.27, 2003). Findings from a case study reflect the true activities at that particular moment and can be used to build theories, especially in exploratory types of research (RAHIM & BAKSH, P.27, 2003).

Many researchers have carried out works on various issues relation to new product development (NDP) using a cases study approach (RAHIM & BAKSH, P.27, 2003). This method of gathering information is widely used as it can ask – and answer r- in depth and probing questions, which may not be possible with other methods (RAHIM & BAKSH, P.27, 2003). The information collected can then be used to build theories related to the research areas. Case study method usually starts with a literature review or desk research followed by company visits (RAHIM & BAKSH, P.27, 2003).

According to Rahim & Baksh, 2003, there has been limited work carried out in the NPD at product based manufacturing companies. Therefore, the research carried out for this study is exploratory in nature and an appropriate approach had to be employed. This approach was inductive rather than deductive. Inductive method encourages theory development or theory extension (RAHIM & BAKSH, P.27, 2003). The goal of such an approach is to expand and build theories rather than to carry out statistical analysis to test certain hypothesis (RAHIM & BAKSH, P.27, 2003). The case study, like the experiment, does not represent a sample, and the investigators role is to expand and generalize theories and not to enumerate frequencies (RAHIM & BAKSH, P.27, 2003).

A case study has the merit of involving all relevant variables involved and observation of actual practice in the field (Rahim & Baksh, p.27, 2003). Qualitative techniques using statistical analysis can record measurements but cannot describe the event or phenomenon of the setting. Statistical approaches cannot examine in detail rare events and developments in NPD (Rahim & Baksh, p.7, 2003). Case study research often reveals a rich detail of information that highlights critical contingencies that exist among the variables and is especially useful for exploration of topics when there is not a strong theory to which one can appeal (Rahim & Baksh, p.28-p.29, 2003).

1.4   Thesis structure

The structure of the thesis is presented in figure 2 below:

Chapter one	Introduction
Chapter two	Sustainable design – tools, techniques & methodologies
Chapter three	Overview of sustainability in the furniture & wood products industry
Chapter four	Focus group
Chapter five	Major case study: Teamwoodcraft Ltd.
Chapter six	Development of sustainable design guidelines: conclusions & recommendations
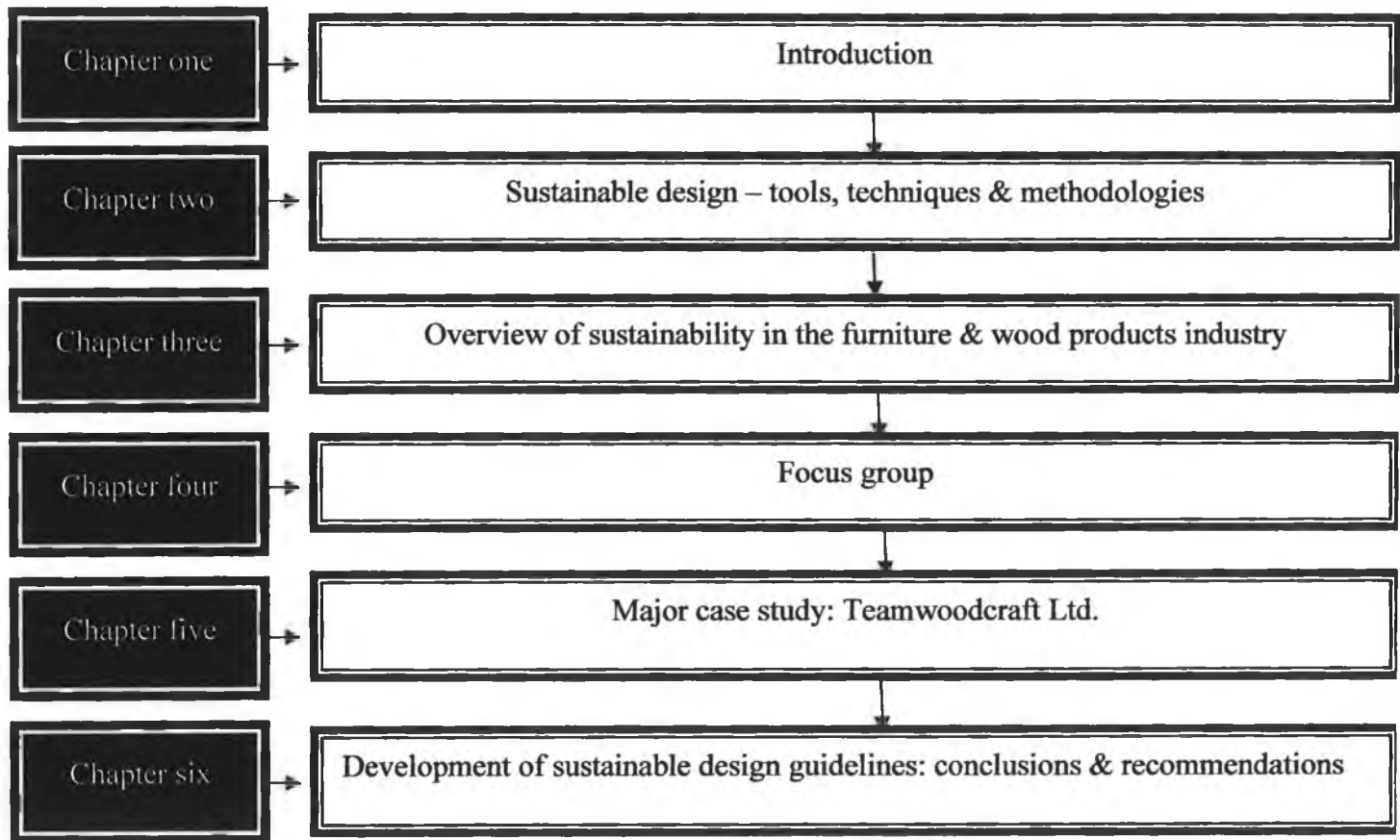
Figure 2 – Thesis structure

Chapter one

This chapter presents an introduction to the thesis motivation, aims and objectives and research approach and structure.

Chapter two

The evolution of Ireland's response to sustainability is examined in this chapter, giving a broad outline of national and international drivers for energy management. An overview of sustainable tools, techniques and methodologies are explored, and current existing management approaches are documented.

Chapter three

In chapter three, sustainable design in the furniture and wood products industry is examined, with particular emphasis on what 'green' or 'sustainable' means to the consumer and its value as a marketing tool.

Chapter four

A major piece of the author's primary research, namely a focus group on sustainability, is detailed in this chapter. The rationale for participant choice, site selection and interview technique are examined and results of the focus group are documented.

Chapter five

A case study based on an Irish furniture company in Co. Laois presented in this chapter five. Company objectives, customer requirements, product design specifications and concept development and refinement for a range of 'eco-friendly' children's furniture were developed: associated drawings, models, prototypes, engineering specifications and manufacturing information are also included.

Chapter six

Chapter six consists of sustainable design guidelines that could be implemented in a furniture company, based on the findings of the secondary and primary research. Conclusions of the study are detailed and recommendations for further study are suggested.

Chapter 2: Sustainable design - tools, techniques & methodologies

2.1   Introduction

As natural resources continue to decline, energy use has a central role in social and economic development on all scales of global economies: from lowering a typical households energy bills to reducing the energy consumption of large manufacturers.   In this chapter the author will review the national and international drivers for the implementation of sustainable systems and technologies and will also give an overview of tools, technologies and methodologies for sustainability currently available to the furniture and wood products industry.

2.2   The evolution of Irelands response to sustainability

The United Nations came together in 1992 to discuss a global framework for international climate change (VICTOR & CULLLENWARD, P.71-72, 2007). The United Nations Framework Convention on Climate Change, called for all countries to work in good faith to address the climate problem and created an organization to oversee the implementation of the treaty's terms. This treaty spawned further attempts to produce climate change agreements, leading to the Kyoto Protocol in 1997 (VICTOR & CULLLENWARD, P.71-72, 2007).

Under Kyoto, the industrialized world - including the U.S., the European Union (E.U.), Japan and Russia - agreed in principle to individually tailored obligations that, if implemented, would cut industrial emissions on average by about 5 percent below 1990 levels (VICTOR & CULLLENWARD, P.71-72, 2007). However some developing countries, which placed a higher priority on economic growth, fueled by unfettered energy use, refused to accept caps on their emissions (VICTOR & CULLLENWARD, P.71-72, 2007).

Ireland supports the level of ambition represented by Kyoto, and is committed to a reduction of emissions by 30% by 2020, provided that other developed countries undertake comparable reductions and the more advanced developing countries make a contribution in line with their capabilities (DEHLG, P.4, 2007).   To achieve this, the Irish government has had to put in place strategic measures such as new environmental policy, standards and regulations and bodies to

implement and regulate these. State bodies put in place to implement these changes include Sustainable Energy Ireland (SEI) and The Environmental Protection Agency (EPA).

International & European drivers

There is a huge potential for Irish and International companies to capitalize on a new 'green' or 'sustainable' wave of business (HICKEY, P.111, 2008). Many companies are positioning themselves environmentally, with a view to obtaining competitive advantage or a unique selling point. They compete with one another to demonstrate their environmental credentials although this has lead, in some instances to a term called 'green washing' where companies claim to have environmentally friendly products/services, but on closer inspection it fails to be really 'environmental' or 'sustainable' (HICKEY, P.111, 2008). Therefore Ireland must strive to maximize its share in this growing economy (HICKEY, P.111, 2008).

European Policy, Directives & Legislation

One of the main means of supporting renewable at a European Union level is through the *Promotion of Electricity from Renewable Energy Sources in the Internal Electricity Market, Directive (2001/77/EC)* (EUROPA, P.39, 2010). Each EU member state, under this directive, is required to commit to specific targets for renewable energy production. The EU target for this directive is the production of 22% of renewable energy sources by 2010. Under this directive, Ireland must achieve 13.2% under this initiative by 2010 and 33% by 2020 (EUROPA, P.39, 2010).

Initiatives for driving energy management

The European Union has been the driving force behind all matters relating to energy efficiency in Ireland, and has required our government to promote energy efficiency in commercial and private lives (HICKEY, P.109, 2008). Advertising campaigns have advised people about what they can do in the home. The *'power of one campaign'* here in Ireland is an example of this, as it tries to educate people in using electricity more economically.

It is difficult to quantify the impact of these campaigns, or separate their influence from that of the other influences that bear on people's behaviour, not least because the most recent data available on our per capita energy consumption is 45, 013 kilowatts, in 2003 (HICKEY, P.109, 2008). Sustainable Energy Ireland notes that the Republic of Ireland improved its energy efficiency by just over 8% between 1995-2005, which was higher that the European Union average of 5.5%

(HICKEY, P.109, 2008). When this figure is examined by sector, we see that transport did poorly with an improvement of under 1%. Residential users did well, registering and 8.2% increase (HICKEY, P.109, 2008). However, encouragingly for the Irish furniture and wood products sector, industry did best, recording an improvement of 15% (HICKEY, P.109, 2008).

National Drivers

The policies driving energy management in Ireland is our compliance with EU directives, to which we are legally bound to implement. The following are a list of policies implemented recently in Ireland:

- Energy White Paper 2007 – 'Delivering a sustainable energy future for Ireland'

- National Climate Change Strategy 2007-2012

- Kyoto Protocol 2005

- National Development Plan 2007-2013

National legislation & Initiatives for driving energy management

This National Climate Change Strategy 2007-2012 builds on the commitment to sustainable development set out in *'Towards 2016'* and the National Development Plan 2007-2013 and is one of a number of interrelated Government initiatives that will address energy and climate change issues (DEHLG, P.4, 2007). These measures will support environmental sustainability, underpin our competitive position and enable us to meet our global responsibilities (DEHLG, P.4, 2007).

Green Paper

The European Commission proposes a common European energy policy which will enable Europe to face the energy supply challenges of the future and the effects these will have on growth and the environment – this policy is called *'The Green Paper'* (EUROPA, P. 51, 2006). This Green Paper is an important milestone in developing an energy policy for the European Union (EU) (EUROPA, P. 51, 2006). The Commission asks the Member States to do everything in their power to implement a European energy policy built on three core objectives:

24

- **Sustainability** - to actively combat climate change by promoting renewable energy sources and energy efficiency.

- **Competitiveness** - to improve the efficiency of the European energy grid by creating a truly competitive internal energy market.

- **Security of supply** - to better coordinate the EU's supply of and demand for energy within an international context (EUROPA, P. 51, 2006).

The Government White Paper

The Energy White Paper 2007 'Delivering a sustainable energy future for Ireland', was launched by the Irish Government in March 2007 (DEHLG, P.4, 2007). The paper is an action based strategy for implementing a new energy future for Ireland. Its primary objectives are to:

- To develop a competitive energy supply industry

- To ensure security and reliability of energy supply

- To develop energy conservation and end-use efficiency (DEHLG, P.4, 2007).

2.3   Overview of sustainable tools, techniques & methodologies

Green productivity signifies this search for clean technologies that reconcile the need for higher output with the mandate to protect the environment (MOHANTY & DESHMUKH, P. 166, 1999). 'Sustainability' is now being recognized as a global issue and slowly being adopted as an organizational philosophy and a set of strategies to manage production innovatively but responsibly, and ultimately, on a more sustainable competitive basis (MOHANTY & DESHMUKH, P. 166, 1999). Reducing waste and pollution and using less energy and fewer material resources are obviously good for the environment, but can also be financially beneficial to industry and commerce because they can cut operational costs (MOHANTY & DESHMUKH, P. 166, 1999). Traditionally in manufacturing, waste is assumed to be a ``simple'' function of the operational process. However, reality is more complex and there may be both a structural and an organisational dimension to it (MOHANTY & DESHMUKH, P. 165, 1999).

Structural dimension

Here the waste may arise from the structural configuration of the system: the nature and amount of structural waste is influenced by the scale, scope, technology, complexity, layout and configuration of the manufacturing process and additionally by ancillary attributes such as control mechanisms (MOHANTY & DESHMUKH, P. 165, 1999).

Operational dimension

Waste here arises from such factors as incompetent and poorly trained workers, inadequate quality systems, poor operational planning and scheduling, poor materials planning, badly maintained equipment, inadequate tools and poor working conditions (MOHANTY & DESHMUKH, P. 165, 1999).

All employees (unless encouraged to do otherwise) have a ``business-as-usual" mindset (MOHANTY & DESHMUKH, P. 168, 1999). Further to this, senior managers are often so busy in their routine fire-fighting operations and meeting daily production targets that they are left with no time to articulate strategies for improved productivity, clean manufacturing and sustainable development (MOHANTY & DESHMUKH, P. 168, 1999). Although managers may be aware of the implications of the non-value-added activities, their focus is often on the rework and not on prevention or avoidance of waste. Where attempts are made to reduce waste, they are most often at the operational level and rarely include examination of the structural, system factors (MOHANTY & DESHMUKH, P. 168, 1999). Similarly, most such reviews and activity are confined to the factory floor; yet there is often considerable scope for examination of the other areas of the business. It is difficult to expect employees to take a real interest in waste and its removal unless they are educated to understand the nature of waste and its causes (MOHANTY & DESHMUKH, P. 169, 1999).

Industry-wide and appropriate national bodies must promote the importance of waste reduction (MOHANTY & DESHMUKH, P. 168 – P.169, 1999). In the light of increasing global pressure to manage the environment more effectively, they must also make managers realize that all organizations have a contribution to make to the ``greening" of manufacturing processes.

Corporate managers must be encouraged to:

- Undertake an assessment of ``wastivity" in their organisations

- Develop internal performance criteria to demonstrate improvements and set targets

- Design ``green productivity" programs

- Ensure effective implementation of the programs (by providing sufficient resources and by defining accountability and responsibility for program implementation)

- Provide appropriate and improved training for staff

- Communicate and report on issues and on the success of the program

- Establish and maintain revised operating procedures and controls

- Monitor performance

- Review and improve the program on an ongoing and regular basis

(MOHANTY & DESHMUKH, P. 168 – P.169, 1999)

Mohanty and Deshmukh (1999) suggest two critical issues that they believe can assist in the transition to 'green' manufacturing, those being:

(1) Organisational learning;

(2) Managing the transition.

They state that socially appropriate manufacturing is now a necessity and that this is a major leadership and managerial problem. Generally, managers and employees do not recognise waste in the system because they take the system as it is granted and given. Although employees may be, or can be made, aware of waste and non-value-added activities, they will naturally focus on waste detection and correction, and not on waste prevention (MOHANTY & DESHMUKH, P. 169, 1999).

2.4   Adoption of existing management approaches

Addressing sustainability is increasingly recognized as an important strategic issue for businesses and other organisations. Sustainable awareness can reduce your organisations climate risk, dependence on finite resources, identify your organisation as an environmental leader to

27

important stakeholder groups such as customers, shareholders, investors, governments officials and employees *(Sanchez, p. 139, 2009).* Energy management processes usually take the approach of continual improvement – plan, check, do, act – demonstrated in the diagram below:
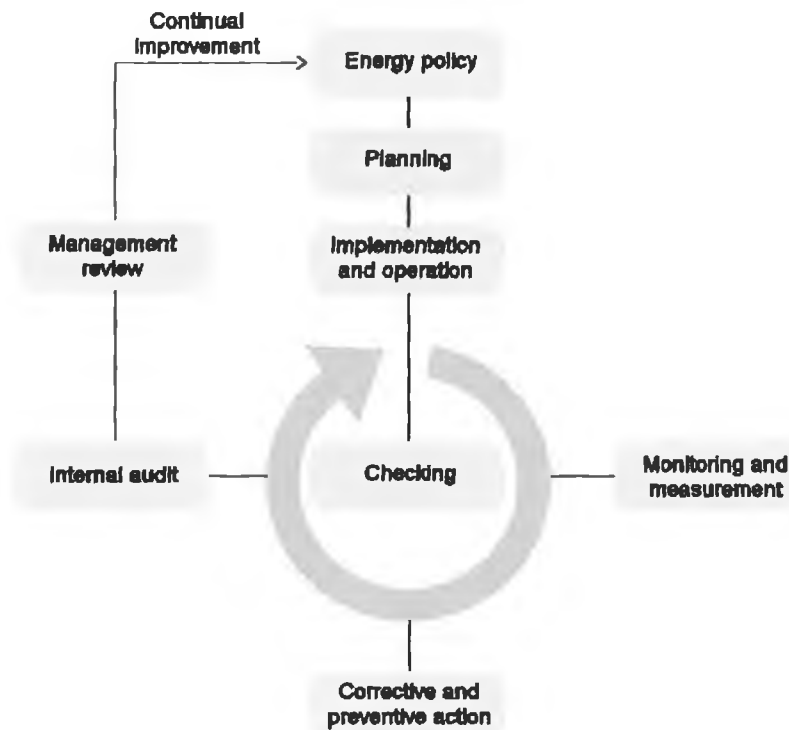
Figure 3 – Energy management - plan, check, do, act (BSI, P.4, 2009)

The proposed and now postponed German legislation on electronic waste has two areas that are of interest to industry today (DOWIE, P.32, 1994). First is the proposal that manufacturers will have to take back their products at the end of their lives, and be responsible for the costs associated with the collection, recycling and disposal of used electronic appliances. The second area is that manufacturers will be required to consider factors such as waste avoidance and recycling of appliances at the design stage. (DOWIE, P.32, 1994). Implementation of waste minimization and re-use strategies (and continuous improvement in this field) can provide a competitive advantage for manufacturer's (MOHANTY & DESHMUKH, P. 169, 1999).

The resulting value gained from a product depends on many factors such as: the types of materials recovered (e.g. non-ferrous metals have highest recycling value whereas plastics have a low value); amount of contamination on the material (this lowers the value greatly); and the

current state of the recycling industry (i.e. current demand). The disassembly cost is totally dependent on the disassembly time; this is multiplied by an hourly rate to allow for some overheads a disassembly plant would have. This disassembly time is dependent on many factors, especially the types of disassembly operations (DOWIE, P.35, 1994).

Beard and Hartmann (1997) find that certification and environmental standards can create awareness and commitment to sustainability, even though in the past such initiatives have drawn sceptisim because of the voluntary nature of participation of some certifications (BEARD & HARTMANN, P.240, 1997). The following are several suitable national and international management approaches which have typically been adopted by furniture and wood product manufacturing industries:

Life cycle analysis

The components of a product life cycle can be defined in various ways depending on the goals and level of detail desired, however there are four typical stages: (1) acquisition and processing of the necessary resources, (2) manufacture, (3) use, and (4) reuse/recycling/disposal (GRAEDEL & ALLENBY, P.383, 2010). The goal of life cycle assessment (LCA) is to quantify or otherwise characterize all of these material flows, to specify their potential environmental impacts, and to consider alternative approaches that can change those impacts for the better (GRAEDEL & ALLENBY, P.383, 2010). Beard and Hartmann (1997) would argue that life cycle analysis (LCA) involves detailed and expensive scientific analysis and LCA is not always possible for many companies because of the sheer volume of their products (BEARD & HARTMANN, P.241, 1997). Recent research also confirms that it is virtually impossible to identify accurately the specific environmental impact of a product and that there is a need to keep the environmental impact judgment process simple and efficient but effective (BEARD & HARTMANN, P.241, 1997).

ISO 14000

ISO 14000 is a standard created by the International Organization for Standardization (ISO). ISO is an international non-governmental organization that promotes the development and implementation of voluntary international standards (ISO 14001, P.7 – 11, 1996). ISO consists of 112 member countries, with the Ireland represented by the National Standards Authority of Ireland (NSAI) (ISO 14001, P.7 – 11, 1996). Standards are developed within ISO technical committees. Draft versions of the standards are sent out for formal support and comments from ISO member

countries, and through iterations, feedback is incorporated to eventually realize an agreed-upon international standard (ISO 14001, P.7 – 11, 1996). The ISO14000 standards are voluntary standards for the establishment of a common worldwide approach to management systems (ISO 14001, P.7 – 11, 1996).

The standards are intended to serve as tools to manage corporate environmental programs and provide an internationally recognized framework to measure, evaluate, and audit these programs (ISO 14001, P.7 – 11, 1996). When implemented, these standards should ensure consistency in environmental management practice, harmonize national environmental standards within an international framework, simplify registrations, labelling and conflicting requirements, provide a single system for all trans-national subsidiaries, and offer guidelines for environmental management excellence (ISO 14001, P.7 – 11, 1996)

The ISO 14000 series can be a good vehicle for increasing the environmental awareness within companies. The international standard can enhance continual environmental improvements of both processes and products (BEARD & HARTMANN, P.240, 1997).

ISO 9000

ISO 9000:2008 is a family of standards for quality management systems (ISO 9000, 2008). Like ISO 14000, ISO 9000 is maintained by ISO, the International Organization for Standardization and is administered by accreditation and certification bodies. The rules are updated, as the requirements motivate changes over time. The quality policy is a formal statement from management, closely linked to the business and marketing plan and to customer needs (ISO 9000, 2008). The quality policy is understood and followed at all levels and by all employees and each employee needs measurable objectives to work towards (ISO 9000, 2008). Decisions about the quality system are made based on recorded data and the system is regularly audited and evaluated for conformance and effectiveness (ISO 9000, 2008). . Records should show how and where raw materials and products were processed, to allow products and problems to be traced to the source (ISO 9000, 2008). You need to determine customer requirements and create systems for communicating with customers about product information, inquiries, contracts, orders, feedback and complaints (ISO 9000, 2008). . When developing new products, you need to plan the stages of development, with appropriate testing at each stage. You need to test and document whether the product meets design requirements, regulatory requirements and user needs (ISO 9000, 2008). You need to

regularly review performance through internal audits and meetings. Determine whether the quality system is working and what improvements can be made. Deal with past problems and potential problems. Keep records of these activities and the resulting decisions, and monitor their effectiveness (note: you need a documented procedure for internal audits). You need documented procedures for dealing with actual and potential non-conformances (problems involving suppliers or customers, or internal problems) (ISO 9000, 2008).

IS393

The Irish Standard (I.S.) 393:2005 Energy Management Systems Standard was developed to ensure that energy management becomes integrated into organizational business structures, so that organizations save energy, save costs and improve energy and business performance (SEAI, 2005). However, in itself, the standard does not establish absolute requirements for energy performance nor does it guarantee optimal energy outcomes (SEAI, 2005).

I.S. 393:2005 is structured and based on existing management standards such as ISO 9001 and ISO 14001. It also includes guidance on the use of the standard which primarily has its focus on the management systems aspects (SEAI, 2005).

The aim of the standard is to put practices in place that are effective, and result in measurable energy savings. In practice, an effective energy management system should result in:

- Organizations taking action to improve energy efficiency,

- Continual improvement year-by-year and an improved performance in energy usage, more

- Thorough analysis of areas with potential for energy saving being carried out, if no action on energy efficiency is being taken (SEAI, 2005).

EN 16000

EN 16000:2009 is a new standard, only introduced in 2009 (BSI, P.4, 2009). This standard specifies requirements for establishing, implementing, maintaining and improving an energy management system. Such a system takes into account legal obligations with which the organization must comply and other requirements to which it may subscribe (BSI, P.4, 2009). It enables the

organization to take a systematic approach to the continual improvement of its energy efficiency (BSI, P.4, 2009).

This standard lays down requirements for continual improvement in the form of more efficient and more sustainable energy use, irrespective of the type of energy (BSI, P.4, 2009).. This standard does not itself state specific performance criteria with respect to energy (BSI, P.4, 2009). This standard is applicable to any organization that wishes to ensure that it conforms to its stated energy policy and to demonstrate such conformance to others. This can be confirmed by self-evaluation and self declaration of conformance or by certification of the energy management system by an external organization (BSI, P.4, 2009)

The EU Eco-Management and Audit Scheme

The Eco-Management and Audit Scheme (EMAS) is an international environmental management tool similar to ISO 14001 (in its components and requirements) (HILLARY, 2004). ISO 14001 provides guidelines that can be implemented by almost any type of organization in any country and was designed primarily to improve management. EMAS, on the other hand, is designed to bring about changes in environmental performance (HILLARY, 2004). Until recently, EMAS was applicable only at the site level, but was revised in April 2001 and now can be applied across entire organizations, EMAS was updated again in November 2009 (HILLARY, 2004.)

EMAS requires organizations to produce an environmental statement; it is more rigorous in mandating reductions in environmental impacts to levels not exceeding those corresponding to economically viable applications of best available technology; and it requires organizations to make much more information publicly available, thereby enhancing a facility's transparency (HILLARY, 2004).

Companies seeking EMAS registration (which is done by a State authority) must report environmental effects and legal requirements at the site, while ISO makes certification (by a private registrar) voluntary (HILLARY, 2004) EMAS requires internal system compliance and performance audits, and external verification must be conducted at least once every three years and requires compliance with environmental regulations and stipulations on continuous environmental improvement (HILLARY, 2004).

32

- Demonstrate an owner's commitment to environmental stewardship and social responsibility (U.S. Green Building Council, 2010)

The Sustainable Furnishings Council

The Sustainable Furnishings Council (SFC) is an American organization of over 400 collaborating furnishing companies that are demonstrably committed to ongoing improvement and rigorous compliance with established sustainability standards (Sustainable Furnishings Council, 2010). They are not independently audited, but rather work as an umbrella group under the SFC logo. The SFC believes that sustainability has become a mandate among the buying public (Sustainable Furnishings Council, 2010). As consumers become more educated, they seek out acceptable choices that meet their needs for style, value, and eco-responsibility (Sustainable Furnishings Council, 2010).

In 2008, they launched a public advertising and in-store tagging program for consumers to identify retailers and products which exceed our threshold sustainability standards rigorous compliance with established sustainability standards to ensure that (Sustainable Furnishings Council, 2010).

Cradle to Cradle® certification

Cradle to Cradle® Certification is a multi-attribute eco-label that assesses a product's safety to humans and the environment and design for future life cycles (Cradle to Cradle®, n. d.) The program provides guidelines to help businesses implement the Cradle to Cradle framework, which focuses on using safe materials that can be disassembled and recycled as technical nutrients or composted as biological nutrients (Cradle to Cradle®, n. d.). Unlike single-attribute eco-labels, MBDC's certification program takes a comprehensive approach to evaluating the sustainability of a product and the practices employed in manufacturing the product (Cradle to Cradle®, n. d.). The materials and manufacturing practices of each product are assessed in five categories: Material Health, Material Reutilization, Renewable Energy Use, Water Stewardship, and Social Responsibility. There are four certification levels; basic, silver, gold and platinum (Cradle to Cradle®, n. d.)

2.5   Chapter summary

In this chapter the author reviewed Ireland's response to climate change and the National, International and European drivers building awareness and need for sustainability. Following this the author documented existing tools, techniques, certifications and methodologies currently being used to help implement sustainable design.

The author found that the growth in our economy and its subsequent slump undoubtedly put pressure on Ireland's emissions and also our ability to invest in 'green' technologies and management approaches. However with challenges, also come opportunities. The scale of the challenge facing us means that we must also look beyond the energy sector to achieve the necessary reductions in greenhouse gases. The 'National Climate Change Strategy 2007-2012' put in place by the department of environment; heritage and local government will involve a lot of changes with regard industrial activities and waste (EUROPA, P.39,2010). . The European Union has been the driving force behind most matters relating to energy efficiency in Ireland, and has required our government to promote energy savings and sustainability through the implementation of different legislation.

On average manufacturers perceive the greatest pressure to improve environmental performance is from legislation and one of the least influential pressures are related to societal driver pressures from individual customers (HOLT & GHOBADIAN, P933, 2009) Mangers and firms are more likely to be comfortable with practices and procedures that are widely accepted, even if there is some economic investment involved (GRAEDEL & ALLENBY, P.384, 2010). Therefore, there author explored the different types of sustainable tools, techniques, methodologies and certifications available to the furniture and wood products industry.

The author found that there was a vast array of certifications to choose from and it was sometimes difficult to assess the merits of one certification or management system over another. The author examined processes such as Life cycle Analysis (LCA), voluntary certifications such as ISO 14001 and ISO 9001 and eco-labels such as Cradle to Cradle. Cradle to Cradle bases itself on certification of sustainable materials and manufacturing processes similar to the Building Research Establishment which assesses the environmental effects associated with building materials over their life cycle - their extraction, processing, use and maintenance,

however this is also quite similar to LCA. Leadership in Energy and Environmental Design (LEED) certification in America gives third-party verification that a building project meets the highest green performance and includes all stakeholders in the process providing training and continual review; however, EMAS is aimed at the management of an organization and is state audited rather than independently audited. Therefore, the author has found that there is a huge amount of choice and overlap between certifications, making it difficult to choose which methodology to implement.

Chapter 3: Overview of sustainability in furniture & wood products industry

3.1 Introduction

Productivity is concerned with efficient transformation of resources into desired outputs (MOHANTY & DESHMUKH, P. 165, 1999). Manufacturing, traditionally, has paid great attention to this conversion in terms of its effect on organizational profit but not on its harmful environmental effects (MOHANTY & DESHMUKH, P. 165, 1999). As pressures rise to establish ``green manufacturing" processes, the issue becomes one of both being seen as socially responsible, and as conforming to increasing legislative and regulatory frameworks (MOHANTY & DESHMUKH, P. 165, 1999). However, to remain competitive, companies need to integrate these strategies so that it does not affect their profitability. In the following chapter the author will investigate the 'green' or 'sustainable' phenomenon and how it could possibly benefit furniture and wood products.

3.2 Sustainability in furniture & wood products industry

Historically, industrial organizations have used productivity as a dominant measure of profitability (MOHANTY & DESHMUKH, P. 165, 1999). There are increasing pressures on organizations and nations in attempting to maintain a steady increase in productivity: increasing competition from both domestic and international players, scarcity of raw materials, costs of energy and manpower etc. (MOHANTY & DESHMUKH, P. 165, 1999). This as well as growing concerns for the negative effects of industry: the ecological damage caused by many industrial processes, and the using up of the world's natural resources (MOHANTY & DESHMUKH, P. 165, 1999).

These changes cause organizations and industries to take a fresh look at productivity and formulate new strategies for managing operations. At the micro level, productivity is defined as the efficient utilization of the resources (inputs) in producing goods and services (outputs). It is a measure of the utilization of physical assets and other resources expressed in such terms as production per hour, man-hours per unit, material utilization rate, machine utilization rate, energy utilization and space utilization etc. (MOHANTY & DESHMUKH, P. 165, 1999). At a macro level, the

productivity of an organization represents its potential and ability to create marketable goods and services at a high level of performance (MOHANTY & DESHMUKH, P. 165, 1999).

3.2.1 The 'green' consumer

A growing number of consumers are actively seeking environmentally friendly merchandise and research has shown that these demands are closely related to lifestyle (WAGNER & HANSEN, P.773, 2005). Multiple factors are found to influence consumers in their adoption of "green" purchasing and it is difficult to ascertain if this is through specific product categories, geographical boundaries, or even through the medium via which the green message is transmitted (WAGNER & HANSEN, P.773, 2005). With a higher consumer awareness of environmental issues, many companies have jumped on the bandwagon by adopting overtly "green" strategies often making environmental claims in their advertising campaigns with the aim of gaining an edge over their competitors (WAGNER & HANSEN, P.773, 2005).

In their paper '*Innovation in large versus small companies: insights from the US wood products industry',* Wagner & Hansen (2005) also state that a well implemented green positioning strategy can deliver that edge by generating a more favourable perception of a brand (WAGNER & HANSEN, P.773, 2005). They also make reference to a recent study by D'Souza et al. (2006) that suggests that it is important to understand how green customers view "ecological" labeling, and what the effect of this view has on intention of the consumer to purchase (WAGNER & HANSEN, P.773, 2005).

In comparison with this '*An empirical study of green supply chain management practices amongst UK manufacturers'* by Holt and Ghobadian (2009), suggests that legislative drivers exert the most perceived pressure on manufacturing organizations. Potential risk associated with health and safety is also highly ranked (fourth), which may reflect the extensive legislation associated with these aspects in manufacturers (HOLT & GHOBADIAN, P943, 2009).

Societal pressures are ranked as one of the least influential factors, apart from the construct of presenting an environmental responsible image (HOLT & GHOBADIAN, P943, 2009). But pressures from most societal stakeholders are ranked quite low. The influence of the supply chain (SC) amongst manufacturers is relatively highly ranked (seventh) (HOLT & GHOBADIAN, P943, 2009), which perhaps reflects the higher risk aspects of manufacturing and targeting environmental improvements through SC pressure from other companies in the SC. Whereas, influence from individual

consumers is amongst the lowest ranked factor (19th) (HOLT & GHOBADIAN, P943, 2009) and perhaps reflects the distance manufacturers experience from the end-users as their products are most often passed along the value chain to distributors and retailers (HOLT & GHOBADIAN, P943, 2009).

3.2.2 'Green' branding

The furniture industry is a competitive domain and it is forcing manufacturers to be in touch with their customers' needs in order to preserve or to increase their market share (TAMMELA & CANEN, P. 362, 2008). Brands are an important and rich source of decision-making information to consumers and positive differentiation from competing brands can be achieved by constructive positioning, and can be exploited as a competitive advantage (WAGNER & HANSEN, P.775, 2005).

Wagner and Hansen (2005) state that consumers are found to respond positively to such environmentally conscious products as The Body Shop range (WAGNER & HANSEN, P.774, 2005). In their paper *'Innovation in large versus small companies: insights from the US wood products industry'*, they found that ecologically concerned consumers responded more positively to fashion advertisements with an environmental message than to those without (WAGNER & HANSEN, P.774, 2005).

However, in comparison, some research findings challenge this view. Laroche et al. (2001) and Crane (2000) are quoted in Wagner and Hansen (2005) as finding *'that consumers formed sceptical attitudes towards green advertising, indicating the danger of consumers avoiding purchase'* and that Karna et al. (2001) proposed that the reason for this scepticism was *'that green claims were limited in scope by the overuse of such terms such descriptions as "environmentally friendly" and "natural"'*.

It was explored in Wagner and Hansen (2005) that consumers may not buy green products because they may perceive them to be of inferior quality and unable to deliver the environmental promises (WAGNER & HANSEN, P.774, 2005). However, more applied research is needed to enhance understanding of who the "green consumers" are, which products they favour, where they buy them, when they do so, why they choose those they do, and how they are influenced by such extraneous variables as word of mouth, publicity, media advertising, sales promotion, merchandising display, store image, and so forth (WAGNER & HANSEN, P.785, 2005).

3.2.3 'Green' supply chain management

Environmental attitude is a key predictor of green supply chain management (GSCM) activity and those organizations that have a progressive attitude are also operationally very active (HOLT & GHOBADIAN, P933, 2009).

Corporate environmental management has typically focused on managing internal environmental practices. Attention is increasingly shifting towards the management of an organization's impacts outside the boundaries of the firm, into the management of upstream and downstream activities (HOLT & GHOBADIAN, P934, 2009).
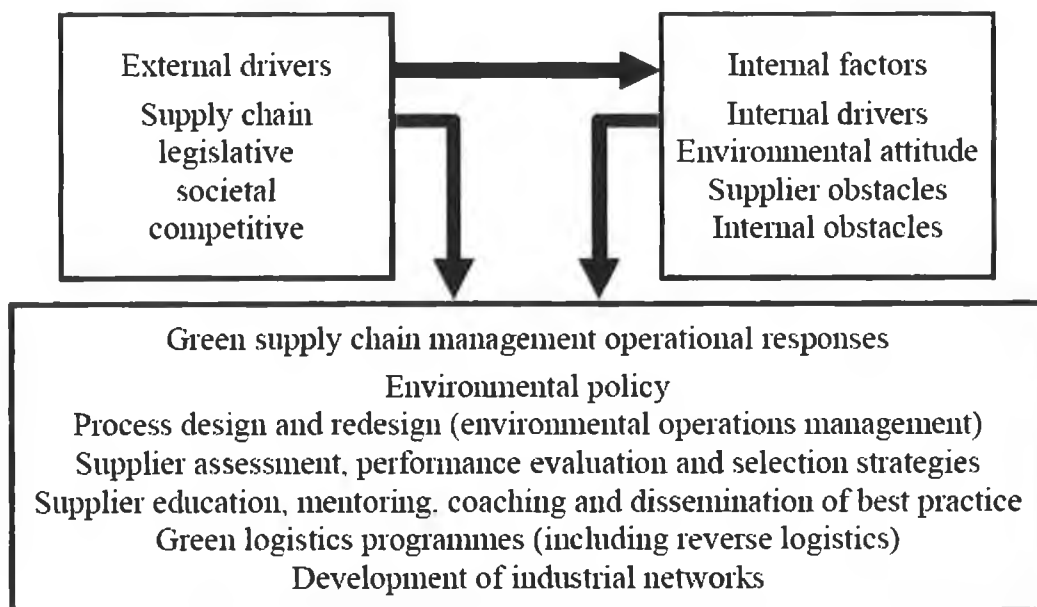
Figure 4 – Green supply management chain (HOLT & GHOBADIAN, P938, 2009)

The most common green supply chain practices focus on internal cost saving activities. There is less effort in the case of in-bound and out-bound logistics. This suggests that there a great deal more that manufacturing organisations can do in greening their supply chains (HOLT & GHOBADIAN, P951, 2009).

The former lone voices urging a concern for the environment while improving business performance are now coalescing into a "movement" (TUTTLE & HEAP, P.93, 2008). New thinking and new ways of approaching old problems show that it is perfectly possible to address these issues

together – but this is most effective when planned as part of a total review of the life-cycle of products and their manufacturing and delivery processes (TUTTLE & HEAP, P.93, 2008).

As the scientific evidence regarding global warming has become widely accepted, so too has the realization by global businesses that resisting the move toward sustainability is no longer a viable business strategy (TUTTLE & HEAP, P.93, 2008). Even in the USA, which has not led this movement, the pressures from the major business community on government to address this issue have become intense (TUTTLE & HEAP, P.93, 2008). Stuart Hart, a business strategy professor at Cornell University, summarizes this view by saying that:

. . . those who think that sustainability is only a matter of pollution control are missing the bigger picture. Rarely is greening linked to strategy or technological development and, as a result, most companies fail to recognize opportunities of potentially staggering proportions (HOLLIDAY ET AL., P.25, 2002).

3.2.4   Benefits of adopting a sustainable business strategy

The possible benefits of adopting a sustainable business strategy are:

(1) Easier hiring of the best talent

(2) Higher retention of top talent

(3) Increasing employee productivity

(4) Reduced expenses in manufacturing

(5) reduced expenses at commercial sites

(6) Increased revenue/market share

(7) Reduced risk, easier financing

(TUTTLE & HEAP, P.98, 2008)

Tuttle and Heap (2008) conclude that it is possible to "go green" and still run a successful business. In fact, your business can be more successful by "going green". They believe it is better to employ 'green' initiatives now, rather than play "catch up" in the future, as compliance rules toughen.   (TUTTLE & HEAP, P.105, 2008). The triple bottom line view is that organizations must

measure their performance in terms of economic outcomes, social outcomes and environmental outcomes (TUTTLE & HEAP, P.100, 2008).

Dowie (1994) concurs with the view of Tuttle and Heap (2008), claiming that manufacturers can no longer continue to encourage consumption, without beginning to take responsibility for the way in which their products will be dealt with at the end of their lives (DOWIE, P.33, 1994). She further states that "green design" is just one of many environmental issues that manufacturers should be aiming for. Some of the factors that are pushing manufacturers this way are: environmental legislation; corporate image and public perception; consumer demand; and rising waste disposal costs (DOWIE, P.33, 1994). However, this situation has not yet arisen so many companies have not seen the need to evaluate their products in these terms. Most companies are led by their marketing departments and such developments will only take place once marketing recognizes it as necessary (DOWIE, P.33, 1994).

The furniture industry has been plagued by long delivery lead times and unreliable schedules (TAMMELA & CANEN, P. 350, 2008). It is a competitive domain and is forcing manufacturers to be in touch with their customers' needs in order either to preserve or to increase their market share. Time compression seems to be a highly competitive advantage source allied to logistics and supply chain strategies and challenges, in order to place the right product at the right time to the right customer in the right quantity (TAMMELA & CANEN, P. 350, 2008).

According to the Swedish Federation of Wood and Furniture Industry (TMF, 2005), the top 20 furniture producing countries account for some 87 per cent of world production. Of these, 11 countries are European, four Asian, four American and one Oceanic. Brazil, Denmark and Sweden are included in those top 20 countries. European Union (EU) furniture manufacturers are the largest furniture producers in the world as well as the largest exporters ((TAMMELA & CANEN, P. 353, 2008).

Fair trade requires a commitment to the conservation of Third World communities. Fair trade consumers are rarely ethically consistent. For example, those who buy Café Direct may pay for the product from a wallet or purse produced by a workforce in a Third World location under conditions of extreme exploitation. The consumer who buys Body Shop products because of their fair trade value may dine on fruit picked by people forcibly removed from their land by a

company which then employs them for starvation wages. Fair trade consumption can have an appeal for people who organize their lives around one particular cause with a moral content (STRONG, P. 36, 1997).

There are three ''green'' questions for businesses as the second decade of the twenty-first century starts to unwind: Are all businesses now sustainable? Are our brands perceived as sustainable? Are our leaders capable of managing sustainability? There is a diversity of opinion over these three challenges, and as the oil continued to spew out of the ground off the Southern coast of the USA in the first major environmental disaster of the decade, the view of how far the business world has come in managing sustainability was never more important (N.A., P. 29, 2010)

In 2010 while many firms may have already adopted green strategies, the question remains how green they actually are, and whether small-to-medium sized enterprises are following their larger cousins both in terms of adoption, and marketing the green message (N.A., P. 32, 2010).

3.2.5 'Green' timber products

Timber is a beautiful, natural material, but harvesting can have significant impacts on the environment (FIRA, P. 14, 2010).. The most important distinction is between timber harvested from old-growth forests and timber harvested from plantations. Regular harvesting from old-growth forests may destroy the habitats of small mammals and birds that rely on the larger, older trees for nesting hollows (FIRA, P. 14, 2010). Forests are being cut at an astonishing rate, destroying our natural heritage and causing long-term ecological damage (FIRA, P. 14, 2010). Rainforests are particularly vulnerable because of the rate at which they are being destroyed and the difficulties involved in regeneration. The United Nations Food and Agricultural Organisation (FAO) has estimated that an average of 17 million hectares of rainforest were cut down each year between 1981 and 1990 (FoE 1996) (FIRA, P. 14, 2010). Designers should therefore specify the use of recycled products or timber that has a proven chain of custody back to well-managed forests (FIRA, P. 14, 2010).

There are two key elements to ensuring that a timber product derives from well-managed sources(TRADA, P.1, 2010).. Firstly the forest of origin has to be independently certified to verify that it is being managed in accordance with the requirements of an accredited forest management standard. Secondly, when the timber leaves the forest, it enters a 'chain of custody' system which

provides independent certification of its unbroken path from the forest to the consumer, including all stages of manufacturing, transportation and distribution (TRADA, P.1, 2010).

Demand for certified products has grown dramatically in the past few years to the extent that, for many organizations, the ability to prove that timber has been derived from a well-managed source is now a key factor in the specification of timber and paper products(TRADA, P.1, 2010). However, it is worth noting that only a comparatively small area of the earth's forests are presently certified, so not all timber available is likely to be covered by the main schemes, and other proof of legality may be required (TRADA, P.1, 2010).

Although product suppliers may inform their customers, in good faith, that their product is from well-managed sources, without a degree of knowledge about chain of custody procedures, it is difficult for the customer to be confident that (s)he is receiving what was specified. Better understanding of the process will improve specification and increase clarity and efficiency throughout the supply chain (TRADA, P.1, 2007).

Manufactured wood products such as medium density fibreboard (MDF), particleboard and plywood have other environmental and health and safety problems that are primarily associated with the resins and glues used in production. Inhalation of particle wood dust is a potential health risk during the manufacturing process (FIRA, P. 14, 2010).

The main two schemes for chain of custody certification in the UK and Ireland are the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC). These are both international schemes (TRADA, P.2, 2007). Other schemes are nationally-based and their certification logos may be seen on imported timber and timber products (TRADA, P.2, 2007).

Products now readily available under certified schemes include:

- Structural timber and timber components (trussed rafters, I joists, etc)

- Joinery items (doors, windows, profiled timber)

- Sheet materials (chipboard, MDF, OSB, plywood)

- Fencing and decking

- Flooring

- Furniture and furnishings

- Paper products. (TRADA, P.2, 2007)

The European Commission is gradually widening the application of Producer Responsibility legislation and with the recent introduction of furniture into the Eco-labelling scheme, it can only be a matter of time until furniture manufacturers are held accountable for the products that they make (TRADA, P.3, 2007). It is vital therefore that the office furniture sector addresses these issues now, so that Irish manufacturers remain competitive with their European and worldwide counterparts(TRADA, P.3, 2007).

Benefits of purchasing certified timbers:

There are many benefits in purchasing certified timber products, including:

- Meeting market demands

- Ensuring that responsible forest management is practiced

- Playing a part in protecting the earth's forests and subsequently, the environment.

(TRADA, P.2, 2007)

At present, the vast majority of office furniture is landfilled at the end of its first customer life, with little re-engineering taking place on a commercial scale (TRADA, P.3, 2007). Historically, market demand for cheap, durable products has been combined with a lack of producer responsibility legislation and a relatively cheap landfill disposal option in Ireland and the UK (TRADA, P.3, 2007). This has deterred the sector from investing the substantial amounts necessary to research new methods of sustainable design and production (TRADA, P.3, 2007).

3.2.6 What is 'eco-design' or 'eco-efficiency'?

The World Business Council for Sustainable Development has developed six key principles of 'eco-efficiency', which are defined as: *"The delivery of competitively priced goods and services that satisfy human needs and bring quality of life while progressively reducing ecological impacts and resource intensity through the life cycle, to a level at least in line with the earth's estimated carrying capacity"* (FIRA, P. 11, 2010).

The six key principles of eco-efficiency are said to be:

1. Increase service efficiency – can the method by which the service is delivered be optimized? E.g. a service manual could be published electronically rather than in the traditional manner.

2. Reduce material intensity – minimize the amount of resources needed for a given product. E.g. specify timber of correct size to minimize wastage and use residue for heating.

3. Optimize material selection – ensure the sustainable management of renewable resources and select less environmentally sensitive resources. E.g. timber from renewable/sustainable resources.

4. Increase the useful lifetime of embodied resources – design for long life and re-use in a way that 'borrows' resources from the environment and returns them to the economy as a usable resource. E.g. produce a bed with a long working life which can be dismantled/refurbished for re-use at the end of its first life.

5. Increase energy efficiency – increase the amount of product per unit of energy consumed.

6. Reduce releases – minimize the quantity and environmental impact of any product residue and by products. E.g. use water based coatings on the desk rather than solvent based coatings (FIRA, P. 11, 2010).

Sustainable products are those that are the best for people, profits and the planet. Any manufacturing process will generate environmental aspects. It is the way that these aspects are controlled or minimised that is important (FIRA, P. 19, 2010).

Some work has been undertaken to identify the main issues and to quantify volumes and wastage rates of particular raw materials (FIRA, P. 19, 2010). This gives a good indicator of waste problems in the sector. These are listed in the table below:

Table 1 - % Waste of furniture materials during manufacture (FIRA, P. 19, 2010)

Material	% Waste
Hardwoods	40 – 50%
Softwoods	10 – 15%
Board Materials	5 – 10%
Fabrics	15 – 20%
Foams	3 – 4%
Steel	3 – 4%
Veneers	40 – 50%

3.3   Chapter Summary

In chapter three the author documented an overview of sustainability in the furniture and wood products industry. This included research into the 'green' consumer and 'green' branding and supply chain management. The author also looked at the benefits of adopting a sustainable business strategy, the benefits of using certified timbers and explored the phenomenon of 'eco-design'.

The mentality within many companies, especially recently, has been one of survival, but there is a failure to see that working towards a more sustainable business may offer not only increased bottom line profits, but also environmental improvements that may benefit the whole of society. (FIRA, P. 29, 2010).

The Furniture Industry Research Association (FIRA) list the following as the major environmental changes in furniture manufacture over the next five years:

- Increased tax burden – especially on landfill and energy
- Further legislation to control emissions
- More requests for sustainable sourcing of timber products
- Increase in recycling and re-use

47

- Furniture returns and end of life

- Reduced packaging

- Reduced product size

- Less demand for storage furniture

- Sustainable business

- Well maintained Environmental Management Systems

(FIRA, P. 26, 2010).

Some of the barriers that FIRA found companies faced in meeting these changes are as follows:

- Lack of investment/capital to meet the changes

- Lack of suitable disposal routes for waste streams

- Knowledge to redesign packaging

- Costs, lack of government incentives

- Good replacement of solvent coatings

- Differences between sustainable certification schemes (FSC and PEFC)

- Disposal costs of old furniture

- Minimum wage

- The resistance of retailers for less packaging

- Further pressure from producer responsibility

- Transport costs

- Lack of consumer awareness of environmental issues

(FIRA, P. 26-27, 2010).

Few of the companies who participated in the FIRA study of sustainability in the UK furniture industry expected their product to alter significantly in the next five years (FIRA, P. 30, 2010). The products general use would essentially be the same, but with a greater emphasis on improved design for recyclability, fewer materials within the product and possible leasing (FIRA, P. 30, 2010). Several of the comments from the forums reflected that companies wanted to work towards sustainable business but were prevented by perceived costs and lack of incentives (FIRA, P. 30, 2010).

FIRA found that the development of schemes such as eco-labels may be the tools to prove environmental excellence within a market whilst also guaranteeing a degree of quality (FIRA, P. 30, 2010). For this type of scheme to be successful though, FIRA felt that public funding will be required to raise the profile of the label so that the correct marketing will benefit the individual companies who pursue this route (FIRA, P. 30, 2010).

Chapter 4: Focus group

4.1 Introduction

In order to investigate 'green design' and the possibility and viability of developing a sustainable design guideline for the furniture and wood products industry in Ireland, the author decided to conduct a focus group as a means of primary research on the topic. The author invited individuals who specialize in design and manufacture of furniture and wood products in Ireland, academic experts from GMIT Letterfrack and Furniture and Consumer Product specialists from Enterprise Ireland. The focus group was held at Enterprise Ireland, at East Point Plaza in Dublin. Topics such as the growing occurrence of 'green washing' in product advertising, how the Irish furniture and wood products industry can meet this challenge, how Irish companies can implement a sustainable design process and if going green really would be viable option for Irish manufacturers in this difficult financial climate. In the following chapter, the author documents: the rationale for using a focus group as a method of qualitative research; the sampling and recruitment of focus group participants; the structure of the focus group; the agenda and the results from the session and feedback from the participants. An audio recording of the focus group was made and is available on request.

4.2 Establishing the focus group

Participants

Randomly sampled groups are unlikely to hold a shared perspective on a research topic and may not even be able to generate meaningful discussions on a topic (MORGAN, P.35, 1997). Therefore, participants for this focus group were not chosen at random because of the specialized nature of the furniture and wood products industry and the specific nature of the information the author sought. Also, determining the group's composition involved seeking out strangers versus allowing acquaintances to participate together. A rule of thumb favours strangers because, although acquaintances can converse more readily, this is often dues to their ability to rely on the kind of taken-for-granted assumptions that are exactly what the researcher is trying to investigate (MORGAN, P.38, 1997). The problem is even more severe when the assumptions amount acquaintances

include invisible boundaries around the subjects that they have tacitly agreed not to discuss (MORGAN, P.38, 1997).

To develop a better understanding of the meaning of 'Green Furniture' and whether or not it is viable to develop sustainable design guidelines for the furniture and wood products, the author needed to recruit leaders in the field of furniture design, manufacture and consumer markets. Participants were first contacted by telephone to gauge their interest in attending such an event. Of the seven participants contacted, six actually attended. Invitations to the focus group were sent via email, with a request to confirm attendance by the 25th June 2010. Also a reminder was sent out about the focus group several days before the event with the agenda for discussion included. The reasoning for this was, to keep the focus group fresh in the participants' minds and to allow them to develop ideas and suggestions on the topic.

Recruitment of participants & determining size of group

According to Morgan 1997 (MORGAN, P.38 – P.43, 1997), simply locating participants and getting them to agree to show up is often not enough; instead, it is essential to develop a careful procedure that ensure that enough participants actually do show up for each group. Also, he states that when working with highly specialized categories of participants, recruitment procedures have to be equally specialized. In particular, it may be necessary to us an incentive to recruit top-level executives or others with unusual expertise. One practical consideration is that, whatever size is selected, it is important to over-recruit to compensate for no-shows. The common rule of thumb is to over recruit by 20%, although the actual extent of over-recruitment depends on whom the participants are, whether they are being paid for their participation, where the groups are conducted and how vital the desired group size is for the overall design of the research. A range of 6 to 10 is a good rule of thumb for focus group size, below 6, it may be difficult to sustain a discussion; above 10, it may be difficult to control one (MORGAN, P.42 – P.43, 1997).

4.3   Rationale for choosing participants

In this section, the author details the rationale for choosing particular participants, they are as follows:

Consumer Product Specialists - Enterprise Ireland

Figure 5 – Enterprise Ireland, 2010

The focus group was kindly hosted at Enterprise Ireland in their headquarters in Eastpoint Plaza in Dublin. It was attended by Declan Cahill, Lorrain Egan and Ruth Sexton, consumer product specialists from Enterprise Ireland.

Enterprise Ireland is the government organization responsible for the development and growth of Irish enterprises in world markets (ENTERPRISE IRELAND, 2010). They work in partnership with Irish enterprises to help them start, grow, innovate and win export sales on global markets (ENTERPRISE IRELAND, 2010). The author felt that as consumer product specialists, these participants would have in-depth knowledge of Irish product placement and that they could contribute immensely to the discussion on the viability of sustainable design guidelines for Irish manufacture.

Academic participants - GMIT Letterfrack

Figure 6 – GMIT Letterfrack, 2010

GMIT Letterfrack has a 20 year history of working very closely with the furniture and wood products industry to produce graduates of very high value to the sector. The author invited two academics from GMIT Letterfrack; Dermot O' Donovan, head of department and Dr. Patrick

Tobin, to get their valuable insights into the current status of the furniture and wood products sector in Ireland.

.Aisling Hurley – Teamwoodcraft, Ballybrittas, Co. Laois

Figure 7 – Teamwoodcraft Ltd., 2010

Teamwoodcraft was established in 1994 by Liam & Aisling Hurley who saw a gap in the market for top quality craftsmanship at a fair price. The company has grown aggressively and now caters for clients within Ireland, around Europe, Africa and the United States of America. Although Teamwoodcraft is mainly a business to business model, supplying architectural woodwork and joinery to bars, hotels and other commercial outlets, they also take private commissions (WWW.TEAMWOODCRAFT.COM/ABOUTUS.HTML, 2010).

Aisling Hurley is the managing director of the company and is responsible for business development, new product research and development and public relations (WWW.TEAMWOODCRAFT.COM/ABOUTUS.HTML, 2010). Her background is in IT where she provided freelancing consultancy and training to the ESB, Coillte, Athlone Institute of Technology and FÁS, among others (WWW.TEAMWOODCRAFT.COM/ABOUTUS.HTML, 2010). She was elected to the board of Laois Chamber of Commerce in 2008 (WWW.TEAMWOODCRAFT.COM/ABOUTUS.HTML, 2010). In the same year she was voted in as Laois Network President (a business organization for women in Laois) and also sat on the first ever Women Entrepreneurs' "Going for Growth" board sponsored by Enterprise Ireland (WWW.TEAMWOODCRAFT.COM/ABOUTUS.HTML, 2010). She is a member of the International Women Entrepreneurs' Association and has been a finalist in the Network Business Woman of the Year Awards (WWW.TEAMWOODCRAFT.COM/ABOUTUS.HTML, 2010). In 2009 she won Business Person of the Year Award. She is to address the Small Firms Association annual conference in September 2010 in Dublin castle (WWW.TEAMWOODCRAFT.COM/ABOUTUS.HTML, 2010).

The author felt that Aisling Hurley would be a good choice of participant because of vast knowledge of the Irish furniture and wood products industry and her experience sitting on a number of different boards. She would also give an important female view point, in a typically male dominated area.

Charles O'Toole –Charles Furniture, Stoneybatter, Dublin 7

charles°furniture

Figure 8 – Charles Furniture, 2010

Charles O'Toole graduated in product design from The National College of Art and Design, Dublin in 1994. A special interest in furniture design led him to study at The School of Architecture in Aarhus, Denmark. From here he set up Charles O'Toole furniture design. Charles' design focuses on creative solutions specializing in one-off furniture and lighting design. The company's philosophy is contemporary design with an emphasis on quality, from the initial design stage to the finished piece (WWW.GMITLETTERFRACKCONFERENCE.IE/CHARLESOTOOLE.HTM, 2010). Charles O'Toole with Patrick O Donnell are the creative force behind charlesfurniture.ie Combined they have over 20 years experience in product and furniture design. Chris Philbin specializes in solid modeling and 3D visualization completing the team (WWW.GMITLETTERFRACKCONFERENCE.IE/CHARLESOTOOLE.HTM, 2010).

The Irish Furniture Designers Network (IFDN) is a registered co-op set up in 2002 by Lorraine Brennan, Charles O'Toole and Leo Scarff as a new voice for Irish furniture designers. Its main goals are to promote the group's work via its website, exhibitions and promotional literature. Since 2002 the network had taken part in several national and international design shows such as Designers Block and the Salone Milano (WWW.IRISH-DESIGNERS.COM, 2010).

The author felt that Charles O'Toole's design experience, coupled with his campaigning for Irish design on the international design front, would make him an ideal candidate to provide information on contemporary Irish Furniture.

Kieran Finane – Finline Furniture, Co. Offaly

Figure 9 – Finline Furniture, 2010

Finline Furniture marks 32 years in business this year. The company is the Ireland largest sofa manufacturer in Ireland, employing over 50 staff. Kieran Finane is managing director. Finline Furniture supplies furniture to over 30 furniture retailers and interior design shops throughout Ireland and over 50 retailers in the UK (LAOIS NATIONALIST, 2008). Manufacturing in Co Laois in the Irish Midlands, Finline Furniture produce high quality, handcrafted upholstery. Their management team travel all over the world every year to source fabrics to ensure our customers have a choice of the most up to date materials available. They purchase fabrics directly from mills in Italy, Belgium and the USA and stock them on our premises (FINLINE, 2010).

The author felt that Kieran Finnane, would be able to bring his vast experience of more than 30 years in Irish furniture manufacture and retail to the focus group, as well as his experiences dealing with retailers and suppliers.

Dr. Adam DeEyto – Lecturer in Industrial & Product Design, Carlow IT

Figure 10 - Institute of Technology, Carlow, 2010

Dr. Adam de Eyto is a lecturer in industrial and product design at the Institute of Technology, Carlow. He holds a Bachelor of Design (Hons.) in Industrial Design and has just finished his doctorate in with Bournemouth University, where he was researching '*Sustainable Design*

Education Learning Strategies for Multidisciplinary education of Undergraduates, SMEs and Design Professional' (IT CARLOW, 2010).

He is the co-facilitator for the ReForm initiative which has developed a series of annual seminars and workshops aimed at building capacity for sustainable design practice amongst Students and professionals (IT CARLOW, 2010).

Adam is the Principal Researcher in the Design CORE at the Institute of Technology, Carlow. The design CORE is engaged with connecting design with the wider spheres of innovation, business practice and sustainable development. The CORE is closely linked to the work on the undergraduate courses in industrial design and product design innovation. The Design CORE has several interconnected strands of design research and is currently active at both an Irish and International level. He has research interests also in the following fields: rapid prototyping and 3D visualization for design; sustainable product service systems and soft product design applications (IT CARLOW, 2010).

With Mr. DeEyto's vast knowledge and credentials in the area of sustainability and his innovative work in design research, the author felt the he would be an excellent candidate to discuss the concept of 'green furniture' and the development of a sustainable design guideline for the Irish Furniture and Wood Products Industry

Joe Friel – Castlebrook Furniture & Design Ltd, Bray, Co. Wicklow

Figure 11 – Castlebrook Furniture + Design, 2010

Joe Friel is the business development manager at Castlebrook Furniture & Design and is also an external examiner for GMIT Letterfrack. Formed in 1982, Castlebrook Furniture & Design Ltd. has developed from a traditional cabinet making facility, to international supplier with world class manufacturing capabilities. They provide a full project management service, from the

design and cost engineering of each product, provision of sample rooms and liaising with all parties involved, right through to the fit-out stages (CASTLEBROOK, 2010).

The author felt that Mr. Friel's business acumen, coupled with his furniture and wood product industry experience, would make him a good participant in the focus group discussion.

John Fitzgearld – Fitzgearlds of Kells, Co. Meath

Figure 12 – FitzGerald's of Kells, 2010

FitzGerald's of Kells are one of Ireland's leading architectural woodwork manufacturing companies, delivering security counters, reception desks as well as boardroom and corporate furniture. FitzGerald's of Kells have been involved in furniture manufacturing since 1963 and now produce work for both the domestic and international market, with exports accounting for over 60% of annual turnover (FITZGERALDS, 2010).

FitzGerald's of Kell's are very aware of their environmental responsibilities and it is their company policy to endeavour to buy only materials from managed sources (FITZGERALDS, 2010).

With 47 years experience in the furniture business, and with international projects being completed in Dubai and the Middle East, the author considered John Fitzgearld to be acutely aware of current changes in the furniture manufacture sector and felt he could bring a wealth of knowledge to the focus group on this subject.

Criteria for site selection
The first consideration in setting up the actual observation was the selection of a site to conduct the focus group. The site had to balance the needs of the participants and the needs of the

researcher; there was little use for sites where participants would not have been comfortable or where it was not possible to record the session (MORGAN, P.35– P.38, 1997). The author first contacted Enterprise Ireland about facilitating the event on their premises and making available a room suitable for the focus group. The location of Enterprise Ireland in Eastpoint Plaza in Dublin was ideal, as most participants were on the east side of the country and could easily avail of bus, rail and road communication networks to Dublin, which could possibly have a positive effect on the decision of the participant to attend the event. The feedback from Enterprise Ireland was very encouraging; they readily made a room and its facilities and parking available and committed to attending the event themselves.

The 'funnel' focus group approach

The author decided to use a 'funnel' based interview technique to facilitate the group. The focus group began with a less structured approach that emphasizes free discussion and then moved toward a more structured discussion of specific questions. The funnel analogy matches an interview with a broad, open beginning and a narrower, more tightly controlled ending (MORGAN, P.41, 1997). This compromise made it possible to hear the participants own perspectives in the early part of the focus group, as well as their responses to the author's specific interests in the later part of the discussion (MORGAN, P.41, 1997).

Determining the interview content

In order to channel the group interaction and create natural progression across topics, three broad discussion questions were set by the author to structure the focus group. These questions were:

1. How are Irish furniture & wood product companies currently dealing with sustainability in design and manufacture?

2. Why would you be interested in 'green' or 'sustainable' design going forward?

3. How would you like to see a sustainable design process implemented - new certification system or integrated approach based on existing certifications?

Table 2 – Focus group structure

Focus group structure	
Date:	Monday, 5th July 2010
Time:	10.30 am
Venue:	Enterprise Ireland, The Plaza, Eastpoint Business Park, Dublin 3
Agenda:	o 10.30 am – 10.40 am – Welcome Note & Introductions o 10.40 am - 12.30 pm – Discussion o 12.30 pm – Session Closing o 12.40 pm – Lunch
In Attendance:	Academic Staff - GMIT, Letterfrack o Dermot O'Donovan, Head of Department, GMIT Letterfrack o Dr. Patrick Tobin, GMIT Letterfrack
	Enterprise Ireland Development Advisors, Consumer Retail Markets Department o Declan Cahill o Lorraine Egan o Ruth Sexton
Participants:	o Aisling Hurley - Teamwoodcraft, Co. Laois o Charles O'Toole – Furniture Designer, Charles Furniture, Dublin o KieranFinane – Finline Furniture , Co. Offaly o Dr. Adam DeEyto - Lecturer in Industrial & Product Design, Carlow IT o Joe Friel - Castlebrook Furniture & Design, Co. Wicklow o John Fitzgerald – Fitzgearlds of Kells, Co. Meath

This structure (see table 2 above) created a natural flow of discussion and debate with some overlap between the topics. According to Morgan 1997, an artificial compartmentalization of the discussion defeats the purpose of using group interaction. He states that it is important to avoid what can be termed as a fallacy of adhering to fixed questions. Instead, the facilitator needs to be free to probe more deeply where necessary, skip over areas that have already been covered, and follow completely new topics if they arise (MORGAN, P.41 - P.48, 1997).

4.3 Focus group findings

Question 1

How are Irish furniture & wood product companies currently dealing with sustainability in design and manufacture?

- o Exercising environmental responsibility (personal ethics)?
- o Is cost a factor?
- o Is there market demand?
- o Are you implementing Green Design?
- o Are you buying Irish timber?
- o Are you recruiting locally?
- o Are you using local suppliers?
- o Are you using environmentally friendly glues & lacquers?
- o What are your experiences with regard accessing about green processes and services?
- o Have you used green products/services?
- o How did you find out about these products/services?
- o What would motivate you to design/manufacture sustainable products?
- o What factors would be important in your decision?
- o Have you invested time/money into exploring 'green' options?

Findings from question 1

Participants had particular experience in end of life responsibility for projects. End of life is a new sustainability dimension which is being built into projects where contractors have to take responsibility for end of life of plastics, packaging etc. and must reconstitute these materials or recycle them back into their processes. This can incur huge waste disposal costs as materials often are not sufficient quality to be used again. Full training must be provided for maintenance purposes and a maintenance manual must be drawn up by the contractor. This is leading more product liability on behalf of the Irish furniture manufacturers, as they are required to take out indemnity insurance, at a huge cost to the company. The end of life maintenance manual contains all certifications on Forest Stewardship Council (FSC) certified woods, performance testing, fire rating and water based lacquers as these can be audited. Irish manufacturers are

60

seeing a lot of accountability built into Irish and UK projects, with a lot of contractual obligations set forth.

Question 2

Why would you be interested in 'green design' going forward?

- o   What messages about the product are important to convey?
- o   What barriers would you foresee to sustainable production in your company?

Findings from question 2

The participants discussed the prominence of 'green washing' in the Irish Furniture context. 'Green washing' is the act of tagging on 'green' or 'sustainable' credentials to a product that may or may not have been designed or manufactured in a sustainable way. However, without tangible and regulated benchmarks on which to gauge these credentials, the consumer ends up making uninformed buying decisions based on feeling that they are contributing a sustainable future by buying a product that is advertised as green.

The participants felt that an Irish 'Brand' of sustainability would be important going forward – as they could then compete on the brand and not solely on cost. They felt that being more sustainable was more important than being 'green', as sustainability should be built into all of their processes and thus, in the long term reduce manufacturing costs and gain increased market share. They noted that the demand for 'sustainable' or 'green' furniture is increasing, and posed the question: 'can we afford not to go green?!' They suggested that implementing a sustainable design process would help gain competitive advantage with tenders and help to increase their export markets. It would be especially important for the companies to increase their market share as profit margins would be reduced because of investment in designing more sustainable processes and possibly gaining accreditation for different certifications. However, it was agreed that proper legislation/guidance would be needed to support the venture, so that they could compete on a level with brands like IKEA and their powerful marketing strategies. It was also mentioned that for public procurement, new regulations on public contracts are being introduced

and that pending implantation, 50% of the projects going forward will have to be 'green'. This would mean that there definitely is a trend of 'green' or 'sustainability' becoming more popular and perhaps, in the near future, legally enforced.

Question 3

How would you like to see a sustainable design process implemented - new certification system or integrated approach based on existing certifications?

- Do you think the furniture industry needs a certification process to verify sustainable Irish products?

Findings from question 3

The participants suggested a 'Principle Based Alliance' – comprising of core principles in order to give an advantage to companies that are already implementing 'green' techniques. This would be a type of umbrella network of Irish furniture designers and manufacturers, who all want to invest in sustainability and want to build a brand associated with value and strong sustainability principles.

They group explored the question of 'green branding' saturation in the market and if it was worth actually investing in sustainability just yet, as the market is evolving very slowly. Furthermore, as there is no metric or legal framework present to audit whether or not companies products really embody sustainable thought and action, they discussed whether or not these words are just sleek marketing jargon tools.

The group agreed that branding this 'Principle Based Alliance' would be crucial and that it should encompass a new certification, as they the group did not think certifications such as ISO 14001 & ISO 9000 were recognisable or valuable brands to the lay consumer. They felt that a need for a new green branding/logo would make the products instantly recognisable. They drew on the guaranteed Irish symbol as a good example of brand awareness. It was mentioned that there wasn't any trade association for Irish furniture manufacturers and that the brand could be

an all encompassing certification system that would unify Irish furniture and wood products manufacturers, creating a level playing field for Irish manufacturers in these testing economic times, whilst also attracting new markets and consumers. This 'Irish Wood Federation Alliance' as the group christened it, would represent integrity and client trust in 'green' design and would help the Irish manufacturers self-regulate.

The group maintained that projects usually depend on baseline costs and that therefore, there is more scope to charge more for 'green products' rather than 'green projects'. However all agreed that a campaign of awareness would have to be developed as products can quickly lose credibility if they are not proven to have true green credentials. Consequently, certification would have cover other countries and perhaps a regulatory body, such as the National Standards Authority Ireland (NSAI), would have to be brought on board to keep a constant focus on the quality and integrity of the 'Irish Wood Federation Alliance'. The group felt that the consumer needs more education on what 'sustainability' really means, in order to make 'green' branding easier for them to understand.

In tandem with actual manufacturing companies, the group explored the idea of a bottom up approach versus a top down approach in order to save on transport, energy and waste costs. These represent the biggest costs for companies and also have a huge impact on sustainability. The bottom up approach would involve activities such as staff training and education on sustainability and manufacturing optimisation, to create sustainability awareness and to save resources at the fundamental bottom level of the organisation or company.

4.4   Chapter summary

There are four broad criteria for an effective focus group interview (MORGAN, P.45, 1997): (1) it should cover a maximum range of relevant topics; (2) provide data that is as specific as possible; (3) foster interaction that explores the participants' feelings in some depth; and (4) take into account the personal context that participants use in generating their responses to the topic. These criteria can be summarized as range, specificity, depth, and personal context (MORGAN, P.45, 1997). The point of doing a focus group interview is to bring a number of different perspectives into contact. Until they interact with others on a topic, individuals are often simply unaware of

their own implicit perspectives. Moreover, the interaction in the group may present the need to explain or defend ones perspective to someone who thinks about the world differently. Using focus groups to create such interactions gives the researcher a set of observations that is difficult to obtain through other methods (MORGAN, P.46, 1997).

As the author wanted to research the topic of developing a sustainable design process for furniture and wood products, she invited six leading Irish furniture designers, academics in sustainability and product designers to explore this concept. This sampling of the group was not a random sample as the author felt specialized knowledge of sustainability and furniture and wood products was necessary to get conclusive and professional suggestions and ideas. The focus group was kindly hosted at Enterprise Ireland in Dublin and was attended by academic staff from GMIT Letterfrack, as well as Development Advisors form the Consumer Retail Markets Department at Enterprise Ireland.

The author used a funnel approach to facilitate the session, which allowed for free thoughts and ideas at the beginning of the session but then later streamed off into three specific knowledge areas, these being:

1. How are Irish furniture & wood product companies currently dealing with sustainability in design and manufacture?

2. Why would you be interested in 'green' or 'sustainable' design going forward?

3. How would you like to see a sustainable design process implemented - new certification system or integrated approach based on existing certifications?

The feedback from the participants was extremely open and frank. As a result of the recession, many Irish manufacturing companies and design practices are running into financial difficulties and are having trouble sourcing more work. Throughout the session they were extremely open in discussing their individual experiences. They were interested in attending the focus group, as they felt that 'going green' and implementing a sustainable design process could help their companies. The group felt that the manufacture of Irish furniture and wood products will phase out, if we cannot find a unique selling point and new markets in which to sell our product.

The group came to the mutual agreement that they would like to meet again in September to discuss starting an 'Irish Wood Federation Alliance'. This 'Principle Based Alliance' would be made up of core principles to give an advantage to companies that are already implementing green techniques. This would be a type of umbrella network of Irish furniture designers and manufacturers, who all want to invest in sustainability and want to build a brand associated with value and strong sustainable principles.

The group explored the question of 'green branding' saturation in the market and if it was worth actually investing in sustainability just yet. They stated that market for 'green' is evolving very slowly and that there is no metric or legal framework present to audit whether or not companies are producing products that really embody sustainable thought and action, or if these words are just sleek marketing jargon tools. All the participants believed that developing and introducing a new certification process to incorporate a sustainable design process was a viable solution. However, they felt that branding for this certification would be of critical importance, as ISO 14001 & ISO 9000 were not recognisable to the lay consumer.

Chapter 5: Major case study – Teamwoodcraft Ltd.

5.1   Introduction

Teamwoodcraft Ltd. (TWC) is a very progressive architectural joinery and furniture manufacturer in Co. Laois. They have enjoyed success in project-based manufacturing in recent years.   This involves taking the requirements and/or specifications of a client, designer or architect and working with them to produce high-quality, high-value products.   It is a business model with a high service level.   TWC is now considering turning their skills to creating high-quality, high-value products to the development of a high-end range of sustainable furniture for children.   They are particularly interested in creating a range of designer 'eco' furniture for exclusive outlets in Ireland.

For the purposes of this case study, the author investigated a 'sustainable' design process for TWC through the design and development of a 'sustainable' children's furniture range.   The author worked with two third year students from GMIT Letterfrack who were carrying out their professional placements.   Jens Kosak was based in the college at GMIT Letterfrack and was responsible for the design and development of the range of furniture in collaboration with Aisling Hurley and the author.   The other student, Evan Predergast, was based in Teamwoodcraft in Co. Laois and through consultation with Jens Kosak and the author, manufactured the final prototype.   The following chapter outlines the company profile, the customer design specifications, concept development and refinement and the final product, as well as associated engineering drawings and rationale for design as well as conclusions on the case study.

Company Profile

In 1994, Liam Hurley and wife Aisling identified a gap in the market for high quality commercial joinery and established Teamwoodcraft Ltd.   At first they employed just three people but as the business developed, the company expanded and now employ some 27 staff including office and administration staff, cabinet makers and fitters. Some 80% of their work involves fitting out hotels, pubs and leisure centres and the remaining 20% comprises of bespoke, one off commissions such as home studies, office and shop fit-outs and game rooms. Period joinery restoration is also a significant part of their business and this involves recreating the

66

original fittings of the property (AIB, 2008). 90% of Team Woodcraft's business is domestic and 10% is for overseas clients (AIB, 2008).

Figure 13 – Examples of joinery work by TWC (TEAMWOODCRAFT, LTD., 2010)

Since the business was established 16 years ago it has grown, on average, by 30% per annum (AIB, 2008). Team Woodcraft had an approximate turnover of approximately €2.5 million in 2007 and a turnover of €3 million in 2008 (AIB, 2008). However, with the recession that hit at the end of 2008, TWC are looking to diversify their capabilities and market base, giving the company an extra competitive edge. According to Teamwoodcraft, there are four major factors that affect the joinery market: general economic conditions, trends in construction output, the use of timber from properly managed forests, and the increasing levels of imports into Ireland of finished wooden products (AIB, 2008).

With this in mind TWC wanted to increase their product-based manufacturing output, which accounts for just 20% of their business. Due to the collapse of the construction industry, entire project-based fit-outs are much fewer, with much competition for tenders. The difference between project and product based manufacturing are explained briefly below:

Project and product based manufacturing

Teamwoodcraft Ltd. are typically engineer-to-order (ETO) or project-based manufacturers. They can also be referred to as a "custom", "make-to-order" or "contract" manufacturing company. These terms describe manufacturers that produce unique and often complex products that are designed to customer specifications, and may require unique engineering design or significant customization, (BRIAN WATSON & ASSOCIATES, 2010), examples of which would be entire hotel or bar fit outs. As a result, each customer order will have a unique set of item numbers, bills of material and routings (BRIAN WATSON & ASSOCIATES, 2010). Product-based manufacturing would describe 'off the shelf' or 'standard' products that a consumer can buy and that are tailored to meet the requirements of a certain market niche, but not individually engineered to a customer's particular specifications. Product-based manufacturing can also be termed "repetitive", "discrete" or "make-to-stock" manufacturing (BRIAN WATSON & ASSOCIATES). All of these terms describe a style of manufacturing rather than any particular industry segment (BRIAN WATSON & ASSOCIATES, 2010).

Manufacturing companies can be classified along a continuum: make-to-stock (MTS) or product based, make-to-order (MTO) and engineered-to-order (ETO) or project based manufacture. MTS companies are usually associated with high volume production (RAHIM & BAKSH, P.26, 2003).. Most of the guidelines on tools for product design and manufacture in literature are meant for mass producers or MTS companies (RAHIM & BAKSH, P.26, 2003).. The design frameworks or models proposed for mass producers are not necessarily suitable for application in project based companies (RAHIM & BAKSH, P.26, 2003). Very little attention in the literature is given to project-based companies that produce products on low-volume basis (RAHIM & BAKSH, P.26, 2003). There is little or no discussion about the framework used in developing the products, although, obviously, an ETO company can achieve its business objective by reducing design iteration and rework, recognizing customers requirements up-front and building quality into design and manufacturing through the use of a comprehensive new product development framework (RAHIM & BAKSH, P.26, 2003).

Other characteristics that typically distinguish project based manufacturing from product-based manufacturing shown in table 3 below. Some of these characteristics (for example, installation on site) may not apply to every ETO manufacturer, or to every product produced, but most of them do (BRIAN WATSON & ASSOCIATES, 2010)

Table 3 – Make-to-stock versus project based manufacturing (BRIAN WATSON & ASSOCIATES, 2010)

Repetitive /Discrete / Make-to-stock	Engineer-to-order / Project-based
Price List	Estimate and Quote
Wins a sale / receives sales order	Wins a contract / receives job order
Standard Products	Unique Products
Standard Cost	Actual Cost
Cost Variances to Standard	Cost Variances to Original Estimate
Purchase Material to Stock	Purchase Material directly to a Project
Flat Bills of Material	Deep & Unique Bills of Material
Ship From Finished Goods	Ship from Work-in-Process
Product Lead Times in Days/Weeks	Product Lead Times in Weeks/Months/Years
High Unit Volume Production	Low Unit Volume Production
Invoiced on Delivery Progress	Billing by Milestones completions
Focus on Material Planning	Focus on Production Scheduling
Forecast Driven	Project Driven
Plan with Master Schedule	Plan with Project Management
Standard MRP	MRP by Project
Delivery to Customer	Installation on Site
Part Number Based	Job Order Based
Design Completed Before Production	Design Integral Part of Production
No or only a few Engineering Changes	Many Engineering Changes / Variations

5.2 Product development – children's 'eco-friendly' furniture range

Alongside TWC's joinery range, they decided to explore opportunities in product-based manufacturing. This would involve manufacturing make-to-stock products. TWC already operate a children's gift store in Castlecomber Discovery Park in County Kilkenny called 'Little Acorns'. Here they sell bric-a-brac children's items, including small pieces of furniture pictured below. These pieces of furniture are bought in from China.

Figure 14 – Children's furniture by TWC (TEAMWOODCRAFT, 2010)

Through their own market research they have decided to try to break into the 'sustainable' or 'eco-friendly' furniture market segment. They aim to do this by first developing a range of high end 'eco-friendly' children's furniture for the Irish market. They propose to sell these at their 'Little Acorns' store, and potentially would like to stock selected retail outlets nationally and possibly in the United States.

5.2.1 Customer Requirements

The first requirements detailed by Aisling Hurley of TWC were:

"I am thinking something very quirky, something to inspire children's imagination but yet a green product. I want it to be functional but beautiful to look at with secret spaces or unusual add-ons etc. I would see these new products as investment pieces, family heirlooms as we are not IKEA. We could look at individualizing each piece to order as well perhaps? I would like the range each year to have 2 collections, spring/summer and autumn/winter so that it is always

interesting and changes or should we just have one theme a year? I am interested in bright colours and illustrations but perhaps we should look at just plain wood finishes?"

- Aisling Hurley, 2010

5.2.2 Product design specifications

Performance

Product needs to meet expectations. It is required to be 'sustainable', but also be of robust nature for children to play with.

Environment

As the product is to be 'eco-friendly' as little impact on the environment as possible is necessary. Sustainable procurement, processing, material use and finishing must be considered at all stages of design and manufacture. Alternatively a very long product life i.e. as Aisling stated making 'heirlooms of the future' would make the product sustainable. Sustainability and low carbon footprint through the use of native hard and softwoods as well as Irish manufactured sheet materials where applicable. Forest stewardship council (FSC) certified material and recycled materials to be specified if possible.

Changes in the Environment

For the products to be successful they must be able to remain stable in their intended environment, and should be able to cope with factors such as humidity and moisture. The materials should be both suitable, and suitably treated to withstand any changes in its environment. The children's furniture is intended for indoor use. There is a possibility of movement during transport, especially if the product will eventually be exported. As the product is a make-to-stock item, the environmental conditions of where it will be stored should be considered.

Product Life Span

As part of the 'eco' status of a product, it is possible that a product can be updated and changed to guarantee long product lifespan, e.g., re-finished and re-upholstered. The product lifespan of furniture is 10 - 12 years (see table 4). Heirloom pieces would need to last generations.

71

Furniture item	Replacement in years	Replacement rate
Seats	10-12	70%
Cabinets	10-12	76%
Desks	10-12	70%
Partitions	10-12	70%

Target Costs

The product is going to be aimed at the high-end market, however the cost of recycled materials and FSC certified woods can be higher than lower grade alternatives, therefore these costs should be build into the target price.

Quantity

The project will involve small batches of products at the start to see how the products sell. Should the concept/designs be successful in the market place, TWC would consider investing in a CNC for mass market production to speed up production and also for personalizing products.

Maintenance

Low maintenance is preferred and as the products are for children, the produced item will have to be easy to wipe down and clean and any soft material components would need to be machine washable.

Marketing

A unique product will stand out in the market place. Aisling Hurley would ideally like the product to be quirky and different so that it can achieve a coveted place on the 'Late Late Christmas Toy Show'. The product will need to be targeted at children but parents need to approve of it too – hence an educational aspect built into the design. The necessary marketing channels for Teamwoodcraft are already in existence as they would like to aim the products at current clientele and can sell them in their 'Little Acorns' store. The product must have a unique selling point – this can be sustainable or 'eco-friendly' nature.

Size & Weight Restrictions

Depending on what type of product that will be designed, the product will either light enough to be moved by children or so heavy that it cannot be moved and cannot fall to prevent injuries. The designed furniture should not have larger parts than the average door size which are 686mm/762mm x 1981mm, unless it can be disassembled.

Manufacturing Processes

As the products will be typically standard, a batch production would optimize the machine time and material usage. TWC has typical joinery manufacturing capabilities which include the following machinery:

- Surface planer

- Thicknesser

- Rip saws

- Band saws

- Panel saw

- Spindle Molders

- Four cutter

- Mortiser

- Tenoner

- Speed sander

- Vertical belt sander

The workshop also has an assembly area, spray room and sanding area. It is important to take into account the machining capabilities of each machine so as to design furniture that TWC have a capacity to make. They do not currently have a CNC but would be willing to invest in one in the future if it proves viable.

Aesthetics

The product needs to be aesthetically pleasing and engaging for children, but it also needs to appeal to parents to buy the product. Aisling Hurley of TWC would like highly precious, quirky or covetable looking product and would like to veer away from any 'IKEA' type product – specifically she does not want a self-assembly product made from medium density fibreboard (MDF).

Materials

The materials the company principally uses are solid hardwoods and softwoods, veneers and MDF. As the product is intended to be 'eco-friendly', 'eco-friendly' materials should also be used where possible. These include sustainably harvested wood and environmentally friendly water based glues and lacquers and are also safe for children.

Standards & Specifications

Furniture standards and safety regulations need to be taken into consideration. As children will be in contact with the furniture, sharp corners and small gaps should be avoided. The entire design, construction and materials selected for the manufacture of the product need to be in accordance with Irish and European Safety Standards. Standards relative to ergonomics must also be considered to ensure the furniture pieces are easy to interact with and safe to use. The following are two safety standards retrieved from the British Standards Website (British Standards online, n.d.) which the author may need to incorporate in the design and manufacture:

- BS EN IS 07250 – Basic human body measurements for technology design

- BS 4875-8:1998. Furniture – Strength and stability of furniture. Methods for determination of stability of non-domestic storage furniture

Ergonomics

The ergonomics of a product are very important for effective flow and ease of use and interaction of a furniture product. As the type of product has not being ascertained yet, the specific ergonomics cannot be stated, however these should be included in the design development during design refinement stage.

Customer Requirements

Following a consultation with the client Aisling Hurley of TWC, she proposed following product specifications:

1. To inspire children's imagination

2. To educate

3. Be functional

4. Eco-friendly

5. Ethical

6. As cost effective as possible to take on distributorships eventually

7. Cost effective enough for parents to warrant investing in it

8. Be heirlooms of the future

9. Extremely covetable

10. Everything about each piece should be unusual

11. Not too time consuming to product (or get production time down to a minimum)

12. Be adventurous enough to warrant an appearance on the 'Late Late Toy Show'

13. Warrant exhibition space in a few Irish embassies

14. Have an Irish theme for possible exporting to the United States

15. Like our existing furniture, it must be exceptional in quality

16. Possible with a few tweaks to recreated a new range twice a year, perhaps varying in theme?

17. Possible to easily personalize

18. In keeping with Aisling's interest in philanthropy, she would like the possibility of one piece from each collection to be donated to a charity fund for children in need, e.g., help children in Haiti, help Irish flood victims, or have reference to another children's charity.

In short, a range of 'eco-friendly' children's furniture for the Irish market, aimed at the high end market, which are aesthetically pleasing, unusual and engaging for children.

Competition

There is lots of competition for children's furniture in the market. Much of the furniture on the market is manufactured in China or Asia and imported at low cost. The new product needs to compete with these products and find its own certain niche through high quality, value for money, exceptional design and customer service and must also appeal to the environmentally conscious consumer.

Company Constraints

The only company constraint is that they do not have a CNC but TWC would look into investing in one, should it be viable. The CNC would speed up batch production and help with personalizing items of furniture.

Installation

TWC have their own team of fitters and installers, however as this is a product based design project and therefore installation should not be necessary. Ideally customers should be able to pick the products up and take them away with them to increase the possibility of sales by impulse buying.

Political & Social Factors

At the moment there is increased concern with the wellbeing of the planet. This can lead to customers being more aware of their carbon footprint and wanting to lead a more sustainable life. Therefore the required furniture needs to lend itself to this 'sustainability'. However, during the primary and secondary research conducted by the author, she found that the product must have true 'green' credentials, otherwise false 'green' advertising or 'green washing' may actually end

Consumer

Sufficient market research has been undertaken by Teamwoodcraft, Ltd., to make them conclude that there is a reasonable market for 'eco-friendly' children's furniture for the high end market. They believe it is a concept that their existing clientele will buy into and also has the potential to attract a new environmentally friendly clientele.

5.2.3 Concept development

Pictured below are a variety of images used by student Jens Kosak to create mood board of what Teamwoodcraft, Ltd. (TWC) wanted to develop as a range. At the start of the design stage, TWC initially wanted to explore a broad range of concepts to develop into an 'eco-friendly' children's range.

Figure 15 – (Above) Dublin Castle (DUBLIN CASTLE, N.D.)

Figure 16 – (Above right) Swan rocker (SWAN ROCKER, N.D.)

Figure 17 – (Above) Volkswagen van, (VOLKSWAGEN VAN, N.D)

Figure 18 – (Above right) Dolls house (DOLLS HOUSE, N.D.)

Figure 19 - Thatched cottage (THATCHED COTTAGE, 2010)

77

TWC like the idea of using an Irish theme so it could also be used as a further marketing tool if they started exporting the products to the United States. Aisling Hurley of TWC liked the idea of using imagery from old Irish myths and fairy tales such as the swans from King Lir and old castles and also old thatched cottages. Similarly she liked the idea of using new modern inspiration such as the Volkswagen van pictured on the previous page.

Following on from this the student began to develop concepts that integrated all the customer design specifications. This resulted in a lengthy design process. The concept development is as follows:
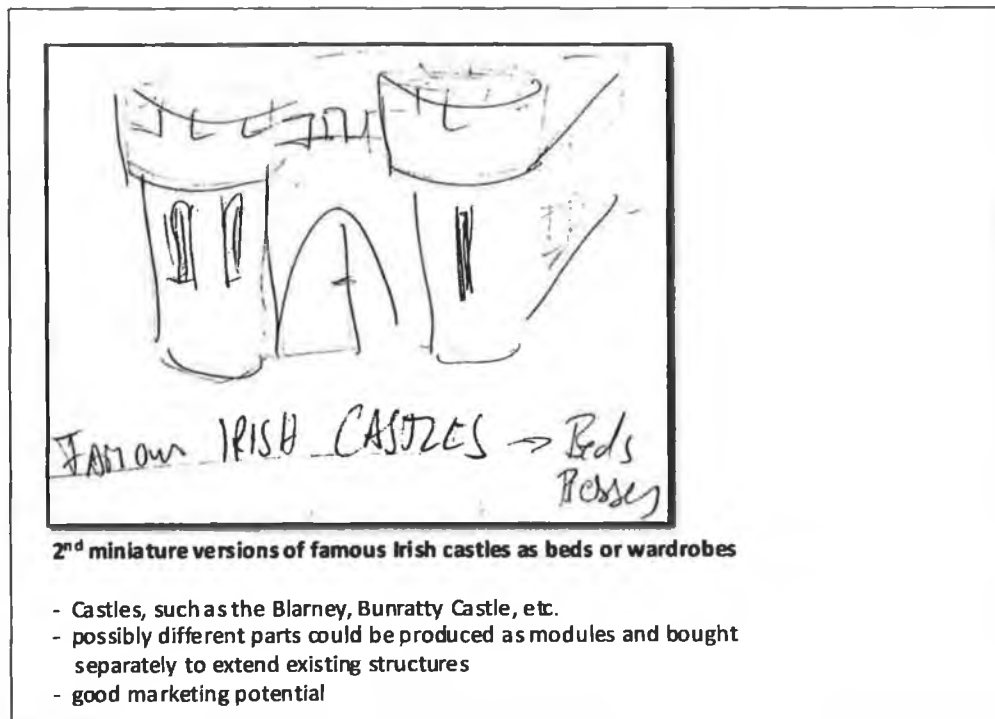
Figure 20 – Castle © Jens Kosak 2010

5th Rocking Cow/ Fish/ Snail

- funny rocking animals
- something cute and different
- similar things have been done
  before but I believe that
  Teamwoodcraft can produce a
  much higher quality product
  than the products available
- potential heirloom
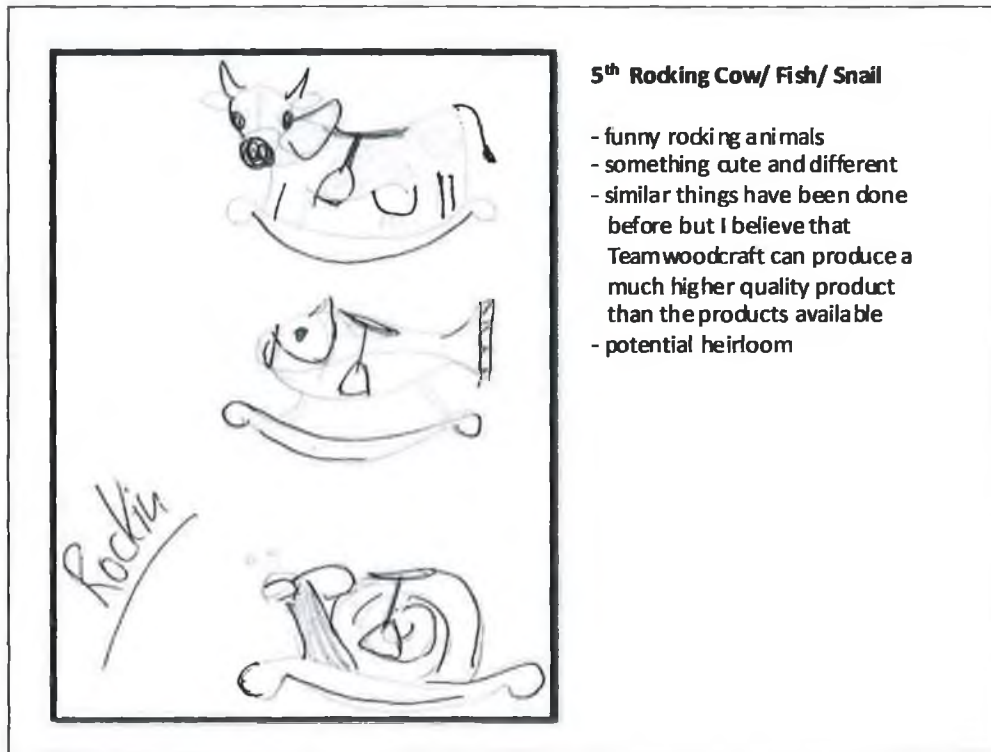
Figure 21 – Rocking animals © Jens Kosak 2010

Piggy-Rocker - Like the old fashioned "building-block-animals"
Made of equal layers of wood, very sustainable

Figure 22 – Piggy rocker © Jens Kosak 2010

Castle-Wardrobe

This is a rotating wardrobe,
Through the centre runs an axle with shelves
(not drawn into the picture) that can be
rotated

-the front half is clothes and can be turned
to the back to reveal "knight-toys" or a play
space.
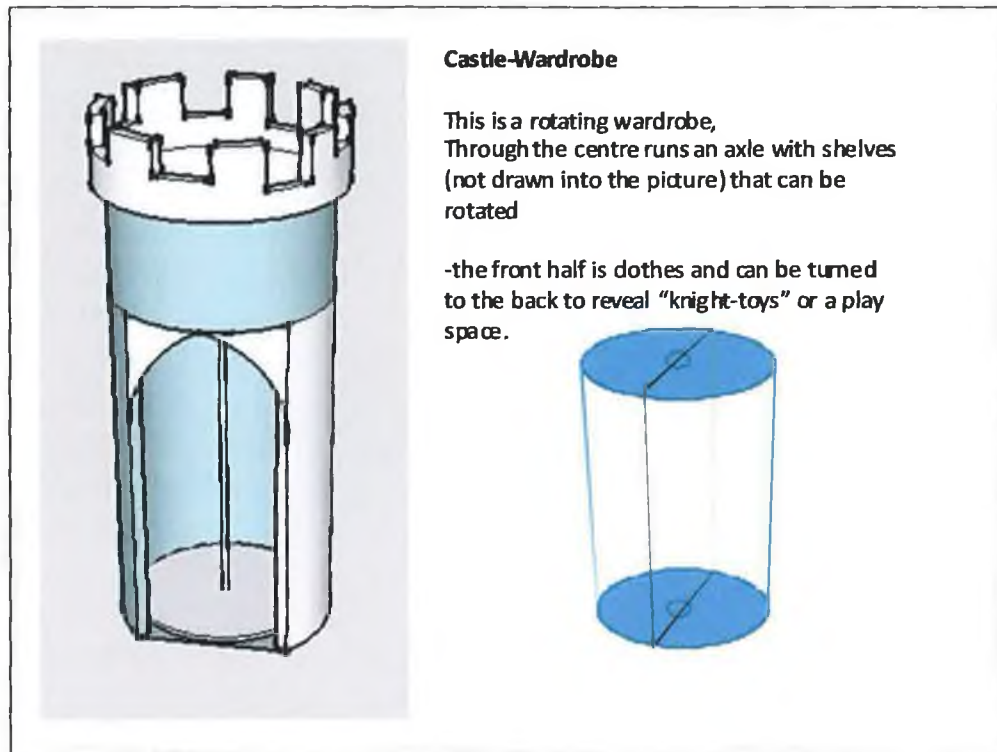
Figure 23 – Turret wardrobe © Jens Kosak 2010

Interior with steering
wheel and car radio or
mp3

Mattress

Storage

Wheels with
turned spokes

Real working car lights

Upholstered
seats or
bench

Wooden
door or
opening
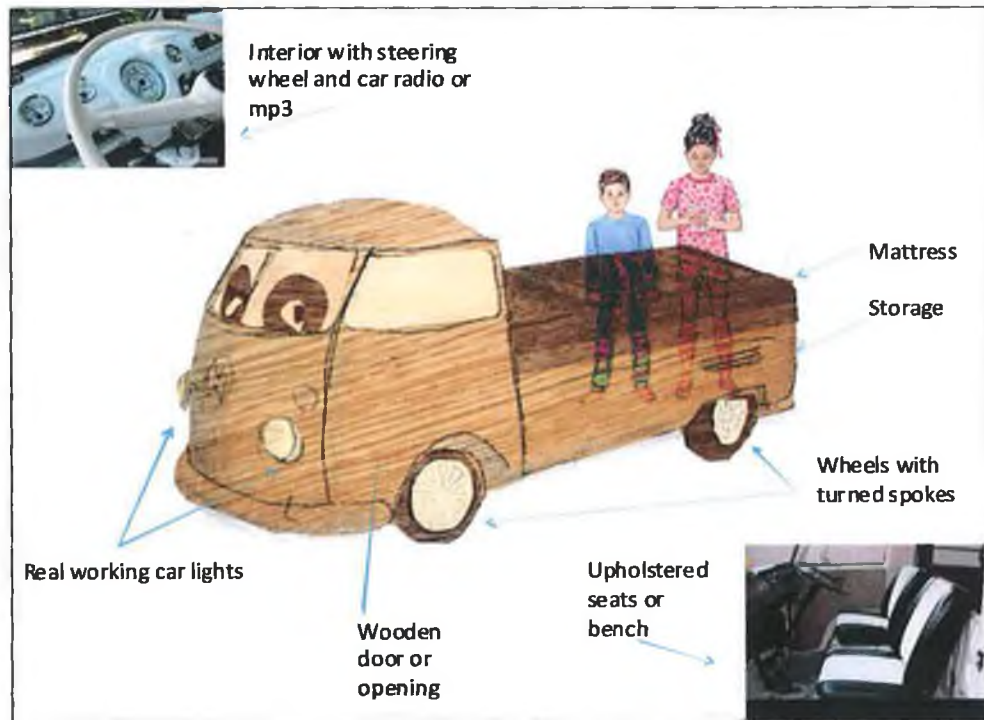
Figure 24 – 2D model - annotated © Jens Kosak 2010

Figure 25 – Paper model © Jens Kosak 2010

5.2.4   Concept refinement

Through consultation with the author and client visits at TWC, the design development resulted in reducing the concept down to some basic fundamentals which are listed below in no particular order:

1. Having a strong Irish theme

2. To be very quirky and unique

3. Encourage children to engage with the product

4. Multifunctional

5. Be easy to make in batches using TWC current abilities

6. Using FSC certified woods

7. Not to have too many bright colours like IKEA

A concept for an Irish village was developed and refined. These would essentially be modular doll's houses with different themes - in keeping with Aisling Hurley's specification for possibly having a different range bi-annually. The concept revolves around having different houses which also have a storage function, a play function and an educational function. The roof is made from a blackboard so children can write on it, there dolls house is divided into compartments and can be used as a dolls house or a wardrobe, a laundry bin or toy storage. These houses are all modular. There will be a standard range of different sizes/functions. The fronts of the house then can be easily tweaked to create a range. An example of an Irish village is pictured below and this may be of particular interest to the American market.

Figure 26 - Farmhouse © Jens Kosak 2010

The houses can be for girls or boys also with various themes like teashops or police stations running through. The houses are made from all flat panels which will simplify the manufacturing process. The doors and windows will be brought in. The original product was specified in all solid FSC timbers to make the product more 'eco-friendly', however TWC felt that the mundane colours may not appeal to children and this was adjusted to having colour.

Should the TWC invest in a CNC in the future, it would be quite efficient and cost effective to manufacture batches of this product on the CNC as it is mostly a flat panel product which could also be easily personalized.

Figure 27 – Village concept© Jens Kosak 2010

5.2.5 Final solution

The final design is a doll's house with a split front panel; the bottom panel is a dedicated play area for the child and the top compartment is meant for storage or vice versa. The roof can be opened with a hinge and is a triangular storage space for small object also. Smaller units functioning as a laundry, toy or paper bins and will have the roof as its only opening. The roof is a black board so that children can write and draw on it. The system of the house is modular

(construction is pictured on the next page) and the shop fronts are interchangeable, for example a Tea shop, Garda station, Post office and etc. The concept of the houses is to have different units/houses and add them together to create a row of houses or a 'village'. New editions can be created and marketed easily and through this a long product life be guaranteed. The product could be redesigned and a mass market approach be taken to produce a lower quality version with the use of CNC technology.
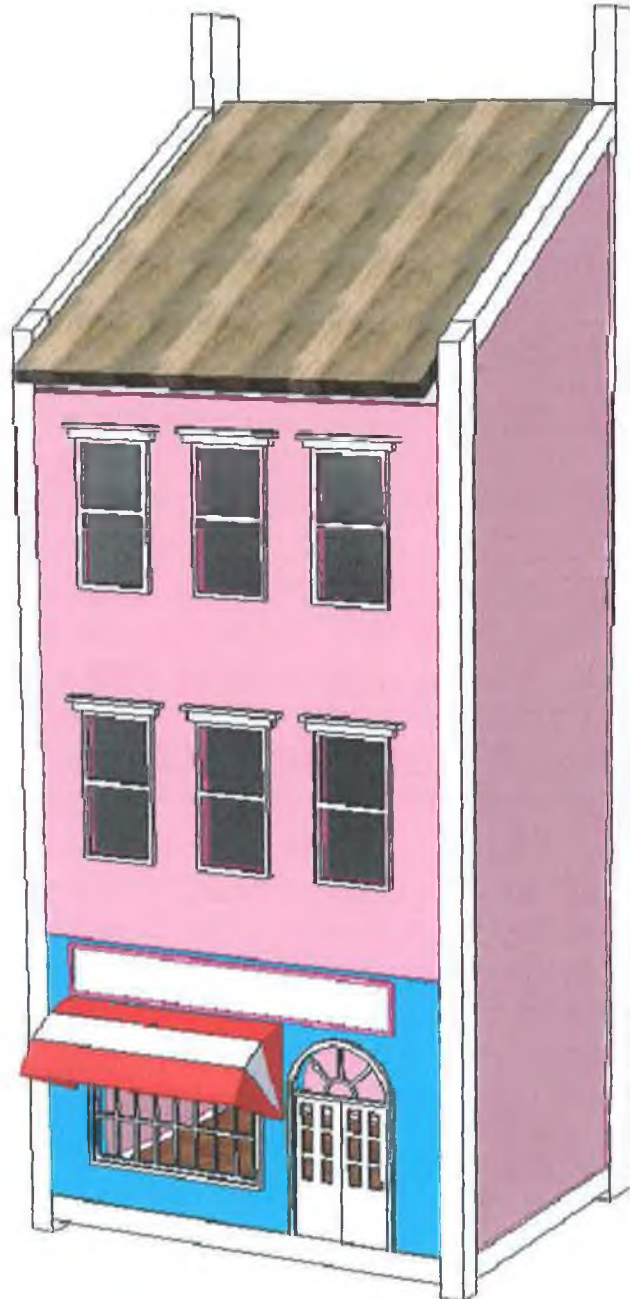

Figure 28 – CAD model solution © Jens Kosak 2010

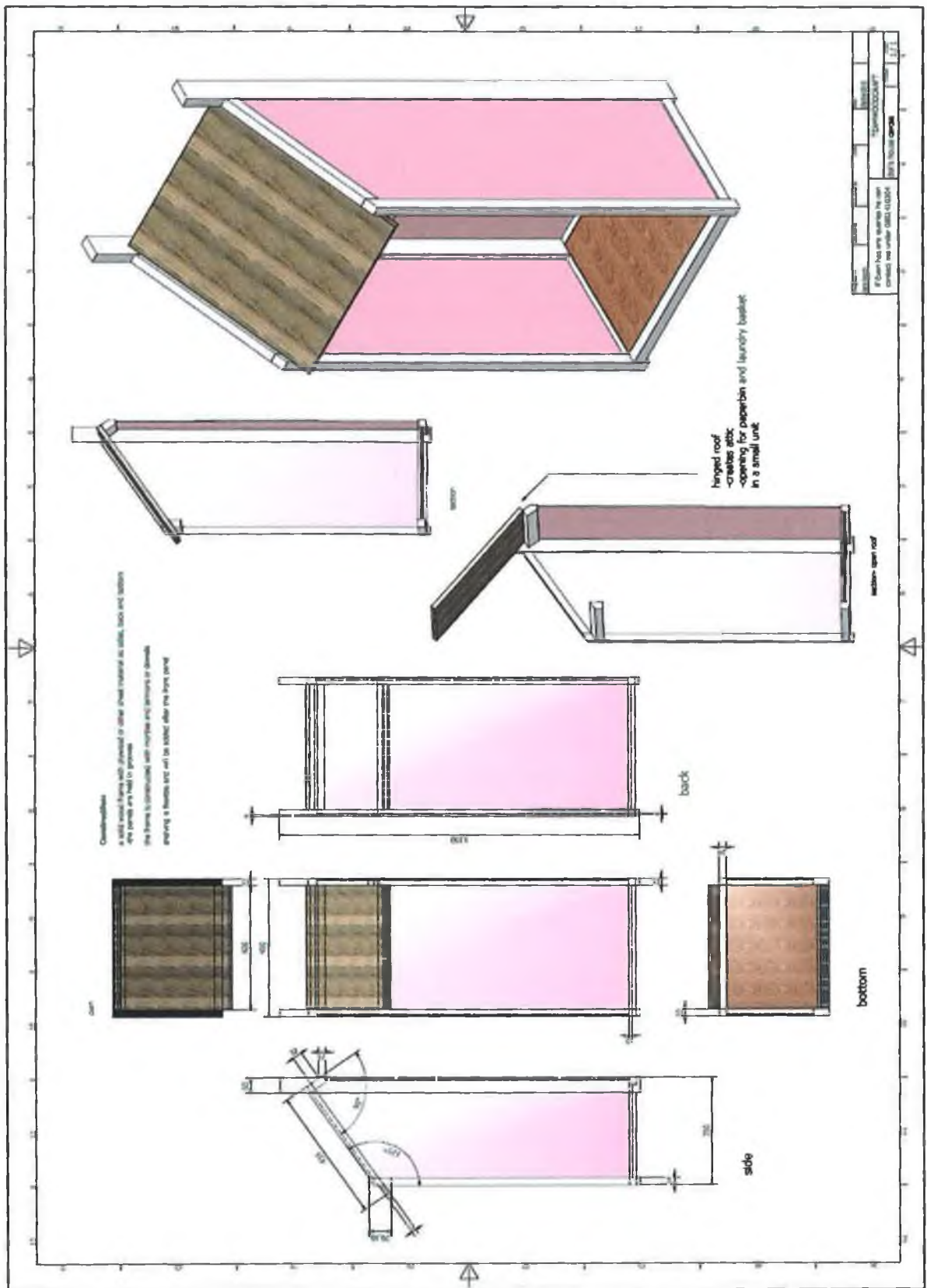Figure 29 – Technical drawing – carcass © Jens Kosak 2010

Figure 30 - Technical drawing – front panel © Jens Kosak 2010

86

Figure 31 – Prototype © Evan Prendergast 2010 & Jens Kosak 2010

Figure 32 – Final Solution© Evan Prendergast 2010 & Jens Kosak 2010

5.3   Chapter summary

In this chapter the author sought to investigate the process of developing an 'eco-friendly' range of children's furniture, based on a case study for Teamwoodcraft Ltd. (TWC), a specialist joinery company in Co. Laois. For this process brainstorming and concept development were carried out with the client Aisling Hurley of TWC and with Jens Kosak, a student designer completing his professional college placement on the project. The concept was then refined and a solution was manufactured in-situ at TWC in Co. Laois by another third year student from GMIT Letterfrack, Evan Prendergast. Associated engineering drawings were also developed and provided to TWC.

The following product specifications were set out by Aisling Hurley of TWC:

1. To have a strong Irish theme

2. To be quirky and unique

3. Engaging and educational for children

4. Multifunctional

5. Be easy to make in batches using TWC current abilities

6. To be sustainable

7. Not to have too many bright colours like IKEA

The first five specifications were easily achieved and are evident in the final solution. The 'Irish Village' concept with a phone box, traditional Irish cottage, a post office and shop, all carry strong Irish connotations. The product allows for many different ranges and designs to be manufactured, and although it is technically a batch product, it can be easily manipulated into a bespoke product by personalizing it using different themes, configurations and lettering. Should TWC invest in a CNC in the future the product would lend itself to a very efficient manufacturing process, where windows, doors and hinge insets could be easily milled out. The idea and design are quirky and unique, it should engage children and encourage them interact with it. The product is multifunctional and has possible uses as a toy, storage or as an educational instrument.

The most interesting outcome of the case study, however, is the 'sustainable' or 'eco-friendly' credentials of the product. The very concept for the project was to come up with an 'eco-friendly' range of children's furniture so that the company could launch themselves into the sustainable furniture market. The company believed that this 'green' initiative would give their company a unique selling point and competitive edge in these recessionary times.

TWC rejected early concepts such as the rocking animals as they were considered to be too brash in colour and too like the 'IKEA' branding image, and also that the sole use of MDF as a material, may give an inferior image to a product which was to be aimed at the high end of the furniture and wood products market. The company originally indicated that FSC certified woods would be used where possible, this coupled with using environmentally friendly water based paints and laquer, and using local suppliers and employees, were intended to seal the label of 'eco-friendly' to the product. However, in real terms, as the design development progressed, the client focused more on the product aesthetics and function rather than its environmental impacts. The company decided not to use FSC certified timbers because of the sheer expense and availability of them. The company also decided to buy in the doll's house windows and doors from the UK as these would be much too time consuming to make. Finally the product had originally being specified to be made entirely of FSC certified timbers, however the client felt that the muted tones of the timber would not entice children to interact with it, so it was made from MDF (to reduce costs) and sprayed in a regular coloured laquer finish.

The author feels that this could be a regular occurrence in the 'green' manufacturing scenario; that although companies conscientiously seek to develop a 'sustainable' product, realities such as the cost of environmentally friendly materials such as FSC certified woods in comparison to imported timbers, coupled with these recessionary times, means that financially the company must operate within their means. Also, from this singular case study, it is clear that the aesthetics of the product and cost outweighed the 'eco-friendly' factor. This is an observation noted in the 'green branding' research conducted by the author in chapter three; that ultimately the most conscientious of 'eco' enthusiasts may be swayed by image and price.

It may be noted that if TWC used an Irish brand of MDF to manufacture the product in the future, this may go some way in redeeming the products 'sustainable' credentials, by using a nationally produced product (reduced carbon foot print of non-imported materials.

In the focus group, detailed in chapter four, the participants explored the question of 'green branding' saturation in the market and if it was worth actually investing in sustainability just yet, as the participants noted that the market is evolving very slowly. Furthermore, as there is no metric or legal framework present to audit whether or not companies' products really embody sustainable thought and action, the participants discussed whether or it was viable to invest in sustainable certifications and processes just yet.

It was explored in Wagner and Hansen (2005) that consumers may not buy green products because they may perceive them to be of an inferior quality and unable to deliver the environmental promises (WAGNER & HANSEN, P.774, 2005).   Therefore, the author feels, that with the economic downturn, and without sufficient drivers in the market and financial incentives, it is difficult for companies justify using resources on trying to compete in market that has not been properly formed yet. As stated in Wagner and Hansen (2005), more applied research is needed to enhance understanding of who the "green consumers" are, which products they favour, where they buy them, when they do so, why they choose those they do, and how they are influenced by such extraneous variables as word of mouth, publicity, media advertising, sales promotion, merchandising display, store image, and so forth (WAGNER & HANSEN, P.785, 2005).

Chapter 6: Development of sustainable design guidelines

6.1 Introduction

Based on the authors' findings from her primary and secondary research, she concluded that a sustainable design certification specific to the furniture and wood products industry would be helpful in evoking consumers trust and confidence in a products 'green' credentials and also to gain a strong foothold for Irish manufacturers as a 'green' brand on the national and international furniture and wood products market. As the development of a entire certification would require a much longer study than was available in the scope of a minor thesis, the author set about drawing up a set of guidelines that could be used as a base point for potentially developing a sustainable certification process for the Irish and perhaps even international furniture and wood products industry.

This chapter documents the author's rationale for the development of sustainable design guidelines and presents the authors sustainable design guidelines concept. Some perceived advantages and disadvantages of implementing the sustainable design processes are also detailed.

6.2 Rationale for development of sustainable design guideline

In order to investigate the viability of developing a sustainable design guideline for the furniture and wood products industry in Ireland, the author first conducted secondary research into sustainable design tools, technologies, the overview of sustainability in the furniture and wood products industry and the examination of 'eco-design', 'green' consumerism and 'green' branding and supply chain management. The most significant evidence for the viability of the sustainable design guidelines, however, came from the author's primary research. Here the author gained invaluable insight into the world of sustainable Irish design and manufacture through the medium of a case study and a focus group on sustainability.

The focus group

The author conducted a focus group as a means of primary research on the topic of 'Green Furniture'. The author invited six individuals who specialize in design and manufacture of

furniture and wood products in Ireland, as well as academic experts from GMIT Letterfrack and Furniture and Consumer Product specialists from Enterprise Ireland. The focus group was held at Enterprise Ireland, at East Point Plaza in Dublin.

The case study

For the purposes of the case study, the author investigated a 'sustainable' design process for Teamwoodcraft, Ltd., through the design and development of a 'sustainable' children's furniture range. The case study followed a typical design and development process; detailing customer design specifications, concept development and refinement and cumulating in final a prototype solution, as well as associated engineering drawings.

The findings of the focus group and case study are well documented in chapters four and five respectively. From the entire study (primary and secondary research), seven fundamental core principles for this sustainable guideline have been identified by the author. They are as follows:

1. End of life – recycling

2. 'Green' Credentials

3. Sustainable harvesting

4. Sustainable Material Choices

5. Sustainable Engineering

6. Education & Outreach

7. Marketing & Branding

The author then used these core principles to expand into guidelines for the basis for proposed new Irish sustainable design guidelines for the furniture and wood products industry. These principles are detailed in the next section.

6.3   Proposed sustainable design guidelines

The following section describes the intent of each sustainable guideline, suggested criteria for implementing it in an organization and the basis for the inclusion of the guideline:

End of life – recycling

Figure 33 – End of life - recycling (GOOGLE, N.D.)

Intent

- To minimize damage to the environment by reducing waste through reuse, reconstitution and recycling.

Recommended Performance Criteria

- Waste should be categorized, segregated, collected and treated accordingly, e.g., wood for wood chipping, metals and irons for smelting, paper, glass, cardboard, etc

- Collection points for waste should be made available on the shop floor – these should be in proper, dry and well ventilated areas to allow for high quality recycling. The quality of the waste affects the recyclability.

- Training should be provided for staff on how to manage and segregate waste and the importance and reason of doing so.

- Packaging should be designed specifically for the product – this will increase the chances of the packaging being recycled by the company

Basis for inclusion of guideline

Manufacturers can no longer continue to encourage consumption, without beginning to take responsibility for the way in which their products will be dealt with at the end of their lives (DOWIE, P.33, 1994).

Implementation of waste minimization and re-use strategies (and continuous improvement in this field) can provide a competitive advantage for manufacturer's (MOHANTY & DESHMUKH, P. 169, 1999). However, resulting value gained from a product depends on many factors such as: the types of materials recovered (e.g. non-ferrous metals have highest recycling value whereas plastics have a low value); amount of contamination on the material (this lowers the value greatly); and the current state of the recycling industry (i.e. current demand).

Participants in the focus group had particular experience in end of life responsibility for projects. End of life is a new sustainability dimension which is being built into projects where contractors have to take responsibility for end of life of plastics, packaging etc. and must reconstitute these materials or recycle them back into their processes. This can incur huge waste disposal costs as materials often are not sufficient quality to be used again.

True 'green' credentials

Figure 34 – Carbon footprint (GOOGLE, N.D.)

Intent

- To ensure true 'green' credentials of the product to maintain customer confidence and avoid 'green-washing', which can damage brand reputation.

Recommended Performance Criteria

From research, the author has found that consumer confidence can be easily lost if consumers feel that the product is not truly 'green'. To avoid this members must:

- Strive for integrity in all areas of procurement, acquisition, manufacture and disposal of product

- Constantly review their processes with a 'check, plan, do, act' policy

- Maintain an element of transparency to all their stakeholders

Basis for inclusion of guideline

From research in chapter two, the author found that many companies are positioning themselves environmentally, with a view to obtaining competitive advantage or a unique selling point (HICKEY, P.111, 2008). They compete with one another to demonstrate their environmental credentials although this has lead, in some instances to a term called 'green washing' where companies claim to have environmentally friendly products/services, but on closer inspection it fails to be really 'environmental' or 'sustainable' (HICKEY, P.111, 2008).

Further to this, Wagner and Hansen (2005) state *'that consumers formed sceptical attitudes towards green advertising, indicating the danger of consumers avoiding purchase'* and proposed that the reason for this scepticism was *'that green claims were limited in scope by the overuse of such terms such descriptions as "environmentally friendly" and "natural"'*. Therefore it is important that a product has true green credentials to attract and keep new customers.

The participants in the focus group facilitated by the author, highlighted the prominence of 'green washing' in the Irish Furniture context. 'Green washing' is the act of tagging on 'green' or 'sustainable' credentials to a product that may or may not have been designed or manufactured in a sustainable way. However, without tangible and regulated benchmarks on which to gauge these credentials, the consumer ends up making uninformed buying decisions based on feeling that they are contributing a sustainable future by buying a product that is advertised as green.

The participants felt that an Irish 'Brand' of sustainability would be important going forward – as they could then compete on the brand and not solely on cost. They felt that being more sustainable was more important than being 'green', as sustainability should be built into all of their processes and thus, in the long term reduce manufacturing costs and gain increased market share.

The participants suggested a 'Principle Based Alliance' – comprising of core 'sustainable' principles in order to give an advantage to companies that are already implementing 'green' techniques. This would be a type of umbrella network of Irish furniture designers and manufacturers, who all want to invest in sustainability and want to build a brand associated with value and strong sustainability principles.

Sustainable harvesting

Figure 35 – Sustainable harvesting (GOOGLE, N.D.)

Intent

- Avoid damage to the environment by using sustainably harvested materials that are extracted in sympathy with the environment

Recommended Performance Criteria

- Chain of custody certification – be able to provide evidence of an unbroken chain of custody from forest to product.

Basis for inclusion of guideline

In chapter three, the author documented that corporate environmental management has typically focused on managing internal environmental practices. Attention is increasingly shifting towards the management of an organization's impacts outside the boundaries of the firm, into the management of upstream and downstream activities (HOLT & GHOBADIAN, P934, 2009).

Timber is a beautiful, natural material, but harvesting can have significant impacts on the environment (FIRA, P. 14, 2010). The most important distinction is between timber harvested from old-growth forests and timber harvested from plantations. Regular harvesting from old-growth forests may destroy the habitats of small mammals and birds that rely on the larger, older trees for nesting hollows (FIRA, P. 14, 2010). Forests are being cut at an astonishing rate, destroying our natural heritage and causing long-term ecological damage (FIRA, P. 14, 2010). Rainforests are particularly vulnerable because of the rate at which they are being destroyed and the difficulties involved in regeneration. The United Nations Food and Agricultural Organisation (FAO) has estimated that an average of 17 million hectares of rainforest were cut down each year between 1981 and 1990 (FoE 1996) (FIRA, P. 14, 2010). Designers should therefore specify the use of recycled products or timber that has a proven chain of custody back to well-managed forests (FIRA, P. 14, 2010).

There are two key elements to ensuring that a timber product derives from well-managed sources. Firstly the forest of origin has to be independently certified to verify that it is being managed in accordance with the requirements of an accredited forest management standard. Secondly, when the timber leaves the forest, it enters a 'chain of custody' system which provides independent certification of its unbroken path from the forest to the consumer, including all stages of manufacturing, transportation and distribution (TRADA, P.1, 2010).

There are four main timber certifications delivered by the following organisations:

- FSC (Forest Stewardship Council)

- PEFC (Programme for the Endorsement of Forest Certification)

- SFI (Sustainable Forestry Initiative)

- CSA (Canadian Standards Association)

Therefore, the author felt that it was important to include sustainable harvesting as s guideline, to support sustainable activities up and down stream form the actual design and manufacture.

Sustainable materials

Figure 36 – Sustainable materials (GOOGLE, N.D.)

Intent

- To create a sustainable products by specifying sustainable materials in product design and manufacture

Recommended Performance Criteria

- Use environmentally preferable materials where possible

- Incorporate salvaged materials and specify reusable, recyclable or biodegradable materials where viable

- Use local materials manufactured regionally where possible to avoid emission damage from transport

- To increase use of sustainable and carbon sink materials such as timber. Using reclaimed timber can be both cheaper and more environmentally friendly than its virgin counterpart.

Basis for inclusion of guideline

The author found that from the case study, it was clear that the aesthetics of the product and cost outweighed the 'eco-friendly' factor. This is an observation noted in the 'green branding'

research conducted by the author in chapter three; that ultimately the most conscientious of 'eco' enthusiasts may be swayed by image and price. Although the company conscientiously sought to develop a 'sustainable' product, realities such as the cost of environmentally friendly materials such as FSC certified woods in comparison to imported timbers, coupled with these recessionary times, means that financially the company had operate within their means, this led to the company being limited in the use for sustainable materials. The more demand the demand that there is for sustainable materials, the more widely available and cheaper they will become. Timber is especially useful in this context as a sustainable material, as it is bio-degradable and a carbon sink.

Further to this, manufactured wood products such as medium density fibreboard (MDF), particleboard and plywood have other environmental and health and safety problems that are primarily associated with the resins and glues used in production (FIRA, P.14, 2002). Inhalation of particle wood dust is a potential health risk during the manufacturing process (FIRA, P.14, 2002).

Formaldehyde, which is used in traditional particleboard and fibreboard to bind the particles together, is a potential health risk through release of free formaldehyde ('off-gassing') in the workplace and after the product has been installed (FIRA, P.14, 2002). Painting or laminating the board can reduce emissions. Alternatives are being developed to replace MDF and plywood. An example is Gridcore™, a recycled fibre material manufactured in a honeycomb formation. The product can be manufactured from 100% recycled paper and cardboard without resins or adhesives. It has yet to be assessed within the context of furniture manufacturing for strengths and weaknesses (FIRA, P.14, 2002).

Sustainable engineering

Figure 37 – Sustainable engineering

Intent

- To incorporate proven engineering techniques to lessen the carbon footprint of the product

Recommended Performance Criteria

- Design for deconstruction should be incorporated at engineering stage – this will allow product to be broken down easily at end of life to allow for efficient recycling/salvaging where possible

- Design for manufacture should be considered – minimizing parts and also minimizing processes means less use of resources

- Use an integrated design process by involving appropriate stakeholders from each discipline and also end users. An integrated design process leads to improved communication and a systems approach to problem solving resulting in optimizing performance at the lowest cost.

Basis for inclusion of guideline

The author felt that sustainable engineering was an important guideline to include as, at present, the vast majority of furniture is landfilled at the end of its first customer life, with little re-engineering taking place on a commercial scale (TRADA, P.3, 2007). Historically, market demand for cheap, durable products has been combined with a lack of producer responsibility legislation and

a relatively cheap landfill disposal option in the UK and Ireland. This has deterred the sector from investing the substantial amounts necessary to research new methods of sustainable engineering, design and production (TRADA, P.3, 2007).

Sustainable products are those that are the best for people, profits and the planet (FIRA, P. 19, 2002). .Any manufacturing process will generate environmental aspects. It is the way that these aspects are controlled or minimised that is important (FIRA, P. 19, 2002). .

Some work has been undertaken to identify the main issues and to quantify volumes and wastage rates of particular raw materials (FIRA, P. 19, 2002). This gives a good indicator of waste problems in the sector. These can be reduced by implementing good engineering practices. These are listed in the table below:

Table 5 - % Waste of furniture materials during manufacture (FIRA, P. 19, 2002)

Material	% Waste
Hardwoods	40 – 50%
Softwoods	10 – 15%
Board Materials	5 – 10%
Fabrics	15 – 20%
Foams	3 – 4%
Steel	3 – 4%
Veneers	40 – 50%

Sustainable engineering can all reduce disassembly time. The disassembly cost is totally dependent on the disassembly time; this is multiplied by an hourly rate to allow for some overheads a disassembly plant would have. This disassembly time is dependent on many factors, especially the types of disassembly operations (DOWIE, P.35, 1994).

Education and outreach

Figure 38 – Education & outreach (GOOGLE, N.D.)

Intent

- In order to be truly environmentally responsible, companies must go beyond monitoring their own actions and educate others. Educating others helps keep all stakeholders (employees, investors and customers) informed on the importance of sustainability, how the product/company meets its environmental obligations and why it is important to do so

Recommended Performance Criteria

- Constant employee training on how to design, manufacture and dispose of products responsibly. Studies have shown that when staff are trained properly (chapter 3) that they will have more interest in the sustainable activities of the company

- Outreach into local communities and schools will benefit the company's reputation but also disseminate the message of the importance of sustainability

- Discuss sound environmental practices with their suppliers

- Continually evaluating and documenting the company's practices to protect the environment

- Conduct planning/ review workshops at key phases with all team members

Basis for inclusion of guideline

As investigated in chapter two all employees (unless encouraged to do otherwise) have a ``business-as-usual'' mindset (MOHANTY & DESHMUKH, P. 168, 1999). Further to this, senior managers are often so busy in their routine fire-fighting operations and meeting daily production targets that they are left with no time to articulate strategies for improved productivity, clean manufacturing and sustainable development (MOHANTY & DESHMUKH, P. 168, 1999).

Although managers may be aware of the implications of the non-value-added activities, their focus is often on the rework and not on prevention or avoidance of waste. Where attempts are made to reduce waste, they are most often at the operational level and rarely include examination of the structural, system factors (MOHANTY & DESHMUKH, P. 168, 1999). Similarly, most such reviews and activity are confined to the factory floor; yet there is often considerable scope for examination of the other areas of the business. It is difficult to expect employees to take a real interest in waste and its removal unless they are educated to understand the nature of waste and its causes (MOHANTY & DESHMUKH, P. 169, 1999).

It was explored in Wagner and Hansen (2005) that consumers may not buy green products because they may perceive them to be of inferior quality and unable to deliver the environmental, therefore, education and outreach is important to build consumer knowledge and confidence.

The participant of the focus group suggested the idea of a bottom up approach versus a top down approach in order to save on transport, energy and waste costs. These represent the biggest costs for companies and also have a huge impact on sustainability. The bottom up approach would involve activities such as staff training and education on sustainability and manufacturing optimisation, to create sustainability awareness and to save resources at the fundamental bottom level of the organisation or company.

Marketing and branding

Figure 39 – Eco-marketing & branding (GOOGLE, N.D.)

Intent

- To advertise the sustainable credentials of the products with integrity

Recommended Performance Criteria

- All sustainable certifications/awards/process information should be available for employees or customers to easily access. This breeds an air of transparency and confidence in the sustainability of the product

Basis for inclusion of guideline

During the focus group, the participants agreed that there was a need for a new green branding/logo would make the products instantly recognisable. They drew on the guaranteed Irish symbol as a good example of brand awareness and felt that certifications such as ISO 14001 were not easily recognisable to the lay consumer. During the focus group, the participants agreed that there was a need for a new green branding/logo that would make the products instantly recognisable.

The Sustainable Furnishings Council (an American organization) believes that sustainability has become a mandate among the buying public (SUSTAINABLE FURNISHINGS COUNCIL, 2010). As consumers become more educated, they seek out acceptable choices that meet their needs for style, value, and eco-responsibility. (SUSTAINABLE FURNISHINGS COUNCIL, 2010).

With a higher consumer awareness of environmental issues, many companies have jumped on the bandwagon by adopting overtly "green" strategies often making environmental claims in their advertising campaigns with the aim of gaining an edge over their competitors (WAGNER & HANSEN, P.773, 2005). As decribed already in the 'green' credentials guideline, products need to have true 'green' credentials to attract and maintain this new market share.

The furniture industry is a competitive domain and it is forcing manufacturers to be in touch with their customers' needs in order to preserve or to increase their market share (TAMMELA & CANEN, P. 362, 2008). Brands are an important and rich source of decision-making information to consumers and positive differentiation from competing brands can be achieved by constructive positioning, and can be exploited as a competitive advantage (WAGNER & HANSEN, P.775, 2005). Therefore, the development of schemes such as eco-labels may be the tools to prove environmental excellence within a market whilst also guaranteeing a degree of quality (FIRA, P. 30, 2002). For this type of scheme to be successful public funding will be required to raise the profile of the label so that the correct marketing will benefit the individual companies who pursue this route (FIRA, P. 30, 2002).

6.4   Proposed 'Green Dot' sustainable design guideline

Figure 40 – Green dot brand (GREEN DOT, N.D.)

In the previous section, the author has outlined seven fundamental principles and developed them into sustainable design guidelines. Collectively, the author has called these proposed sustainable

design guidelines 'Green Dot'. The word 'green' is used as a reference to the guidelines Irish roots in the furniture and wood products industry but also, to indicate the sustainable or 'green' intention of the guidelines. This name carries strong branding imagery and would be easy to market as a label or as a sticker on certified sustainable products under this umbrella.

The 'Green Dot' sustainable guideline is presented in a graphical format below in figure 41:
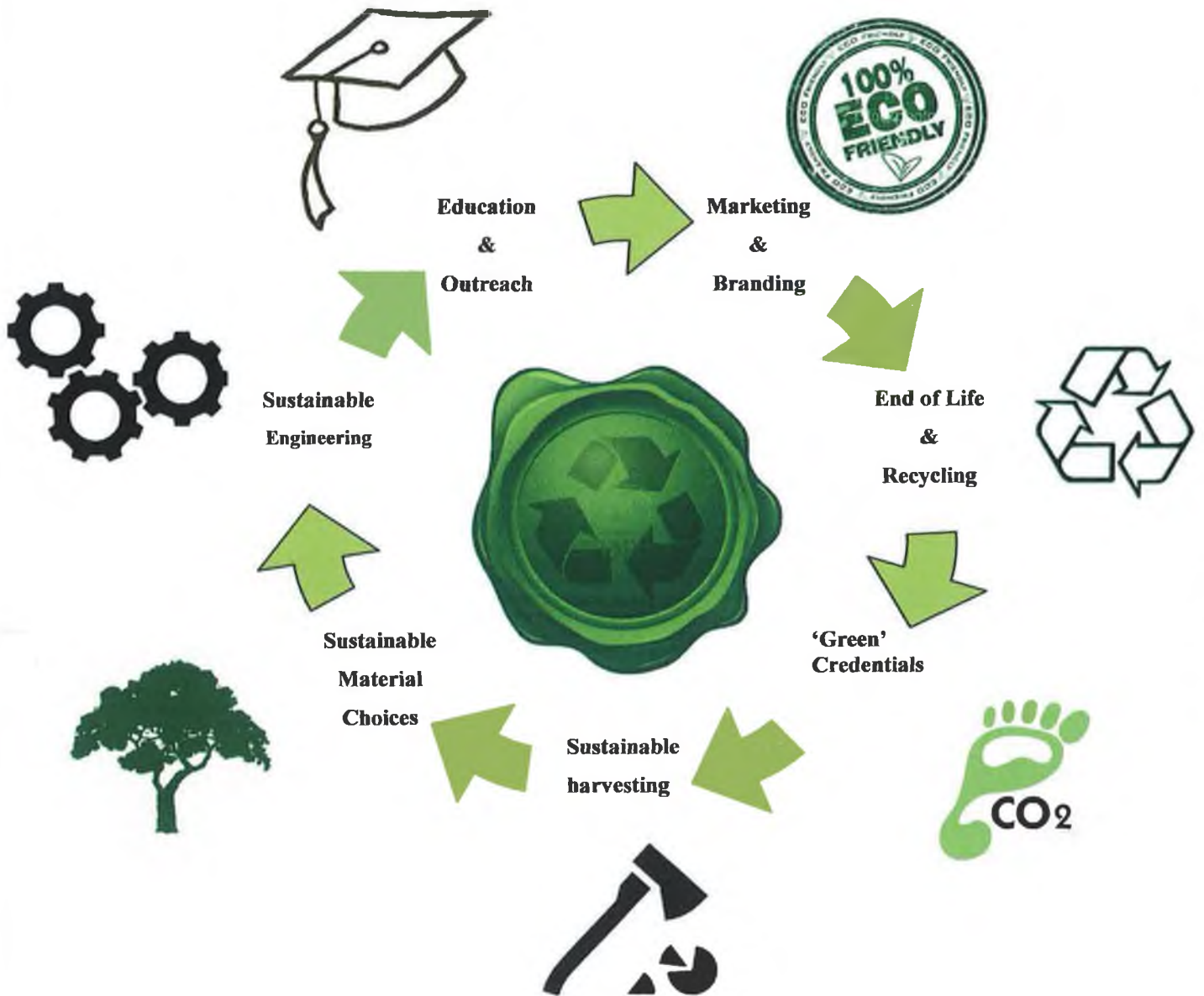

Figure 41 – Proposed sustainable design guidelines for furniture & wood products

106

Possible internal benefits of implementing Green Dot

- Demonstrate environmental responsibility
- Be an industry leader
- Enhance quality and investment in people systems
- Quality of management improved
- Improved level of training
- Legal compliance is documented and can be demonstrated
- Stimulate improvements in manufacturing processes, transport, raw materials and packaging
- Cost savings from energy and waste reductions and efficiencies
- Improved employee morale
- Provides a platform for better communication and dialogue between staff and stakeholders

Possible external benefits of Green Dot

- Create a positive public image
- Gain new customers/business and satisfy existing customers
- Stay in business (recessionary times)
- Environmental friendly products – unique selling point
- Constantly reviewed, so continual environmental performance improvement
- Legal compliance
- Increased energy and material efficiencies – resulting in possible cost savings
- Reduced pollution and environmental damage
- Develop better customer, employee and supplier relationships and communication
- Set and example for other companies in a sector

Possible disadvantages of Green Dot

- Higher than usual staff training costs
- Capital expenditure may be required
- A certification/consultancy fee may have to apply to ensure company's compliance, if the certification is to be developed going forward

- Time and associated cost required to develop sustainable processes/training within the company – however this may be possibly offset by increased market share of innovative 'sustainable' products.

- Economic climate – lack of market drivers

- Uncertainty about value/promotion of 'sustainable certification' in market place (economic downturn)

- Lack of financial state support to implement such initiatives

- Expense of sustainable materials may be more that cheaper imported materials

6.5   Chapter summary

Through the author's primary and secondary research, she concluded that a sustainable design certification specific to the furniture and wood products industry would be helpful manufacturing tool. As the development of an entire certification would require a much longer study than was available in the scope of this minor thesis, the author drew up a set of guidelines that could be used as a base point for potentially developing a sustainable certification process for the Irish furniture and wood products industry.

Seven fundamental core principles for this sustainable guideline have been identified by the author. They are as follows:

1. End of life – recycling

2. 'Green' Credentials

3. Sustainable harvesting

4. Sustainable Material Choices

5. Sustainable Engineering

6. Education & Outreach

7. Marketing & Branding

The author documented the intent, recommended performance criteria and basis for inclusion of each guideline and then presents her sustainable design guidelines concept called 'Green Dot'. The author suggests that implementing these sustainable guidelines can benefit a company in many ways by enhancing quality and investment in people and systems, improving level of training, financial savings from energy and waste reductions and efficiencies, improved employee morale and creating a unique selling point. There are also some disadvantages to implementing such a process, including the current recession, cost of training and the lack of market drivers and incentives.

Chapter 7: Conclusions, recommendations & future work

7.1   Thesis Summary

Productivity is concerned with the efficient transformation of resources into desired outputs (MOHANTY & DESHMUKH, P. 165, 1999). Manufacturing, traditionally, has paid great attention to this conversion in terms of its effect on organizational profit but not on its harmful environmental effects (MOHANTY & DESHMUKH, P. 165, 1999). As pressures rise to establish 'green manufacturing' processes, the issue becomes one of both being seen as socially responsible, and also conforming to increasing legislative and regulatory frameworks (MOHANTY & DESHMUKH, P. 165, 1999).

This thesis presents the research and development of sustainable design guidelines for the furniture and wood products industry, suitable for sustainably enhancing design, manufacturing and associated activities. This sustainable guideline is based on secondary research conducted on subject areas such as 'eco' design, 'green' branding and 'green' consumerism, as well as an examination of existing certifications and sustainable tools techniques and methodologies, national and international drivers for sustainable development and an overview of sustainability in the Irish furniture manufacturing context.

The guideline was further developed through primary research. This consisted of a focus group and a case study. The focus group was attended by leading Irish designers, manufacturers and academics in the area of furniture and wood products. This group explored the question of 'green branding' and the viability of investing in sustainable manufacturing processes going forward. For the purposes of the case study, the author investigated a 'sustainable' design process for Teamwoodcraft, Ltd., through the design and development of a 'sustainable' children's furniture range. The case study followed a typical design and development process; detailing customer design specifications, concept development and refinement and cumulating in final prototype, as well as associated engineering drawings.

Seven core principles for sustainable design guidelines were identified by the author through primary and secondary research. They are as follows: end of life – recycling, 'green' credentials, sustainable harvesting, sustainable material choices, sustainable engineering, education and

outreach and marketing and branding. The author then used these core fundamentals to expand into guidelines for the basis of proposed new Irish sustainable design guidelines for the furniture and wood products industry. The intent, recommended performance criteria and hypothesis for the development of each guideline is also documented, as well as perceived benefits that such guidelines could incur.

7.2   Thesis conclusions

For this study the author aimed to research and propose a set of sustainable design guidelines for the furniture and wood products industry in Ireland. The aims and objectives of the study were:

1. To examine the current status of sustainability the Irish furniture and wood products industry.

2. To investigate Irish manufacturer's attitude to incorporating 'green' design and if it is a viable option going forward.

3. To develop sustainable design guidelines for the incorporation of 'green' or sustainable design in the Irish furniture and wood products industry.

Examination of the current status of sustainability in the Irish furniture and wood products industry

The author reviewed Ireland's response to climate change and the National, International and European drivers building awareness and need for sustainability. Following this the author documented existing tools, techniques, certifications and methodologies currently being used to help implement sustainable design.

From this review the author found that the growth in our economy and its subsequent slump undoubtedly put pressure on Ireland's emissions and also our ability to invest in 'green' technologies and management approaches.

The author examined processes such as Life cycle Analysis (LCA), voluntary certifications such as ISO 14001 and ISO 9001 and eco-labels such as Cradle to Cradle and concluded that there are a vast array of certifications currently available to furniture manufacturers' but that it was

difficult assess the merits of one certification or management system over another due to overlap in guidelines, voluntary versus mandatory auditing, implementation costs and stake holder benefits.

It was concluded by the author that a growing number of consumers are actively seeking environmentally friendly merchandise and it is hard ascertain if this is through specific product placement or personal choice, and therefore, it is also difficult to define the buying habits of an 'eco' consumer. Some consumers are cautious of buying a perceived 'green' product because of a saturation of 'greening' in the market place. Also because there is no legally binding metric in place, there are many loop holds that manufacturers can use to launch a product labeled 'sustainable' onto the market, which may in fact have low 'sustainable' integrity, thus weakening consumer confidence in 'green' products.

The author also found that there are various types of sustainable materials available to manufacturers', but prices of such and accessibility, often deter investment.

Investigate Irish manufacturers' attitude to incorporating 'green' design and if it is a viable option going forward

To reach conclusions on the attitude of Irish manufacturers' to incorporating 'green' design, the author conducted a focus group on sustainability and a case study on the manufacture of a range of 'eco-friendly' furniture. For the focus group the author invited six leading Irish furniture designers, academics in sustainability and product designers to explore this concept. This sampling of the group was not a random sample as the author felt specialized knowledge of sustainability and furniture and wood products was necessary to get conclusive and professional suggestions and ideas.

The author found that participants had particular experience in end of life responsibility for projects. End of life is a new sustainability dimension which is being increasingly built into projects where contractors have to take responsibility for end of life of plastics, packaging etc. and must reconstitute these materials or recycle them back into their processes. This can incur huge waste disposal costs as materials often are not sufficient quality to be used again.

The participants suggested a 'Principle Based Alliance' – comprising of core principles in order to give an advantage to companies that are already implementing 'green' techniques. The author feels that this type of umbrella network of Irish furniture designers and manufacturers, could build a brand associated with value and strong sustainability principles.

The group agreed that branding this 'Principle Based Alliance' would be crucial and that it should encompass a new certification, as they the group did not think certifications such as ISO 14001 & ISO 9000 were recognisable or valuable brands to the lay consumer. They felt that a need for a new green branding/logo would make the products instantly recognisable. They drew on the guaranteed Irish symbol as a good example of brand awareness. It was mentioned that there wasn't any trade association for Irish furniture manufacturers and that the brand could be an all encompassing certification system that would unify Irish furniture and wood products manufacturers, creating a level playing field for Irish manufacturers in these testing economic times, whilst also attracting new markets and consumers. This 'Irish Wood Federation Alliance' as the group christened it, would represent integrity and client trust in 'green' design and would help the Irish manufacturers self-regulate.

The participants discussed the prominence of 'green washing' in the Irish Furniture context. 'Green washing' is the act of tagging on 'green' or 'sustainable' credentials to a product that may or may not have been designed or manufactured in a sustainable way. From this, the author deduced that without tangible and regulated benchmarks on which to gauge these 'sustainable' credentials, the consumer can end up making uninformed buying decisions with regard to 'sustainable products'.

From the case study conducted for Teamwoodcraft, Ltd., the author feels although companies conscientiously seek to develop a 'sustainable' product, realities such as the cost of environmentally friendly materials such as FSC certified woods in comparison to imported timbers, coupled with these recessionary times, means that financially the company must operate within their means. Also, from this singular case study, it is clear to the author, that the aesthetics of the product and cost outweighed the 'eco-friendly' factor. This is an observation noted in the 'green branding' research conducted by the author in chapter three; that ultimately the most conscientious of 'eco' enthusiasts may be swayed by image and price.

It was explored in Wagner and Hansen (2005) that consumers may not buy green products because they may perceive them to be of an inferior quality and unable to deliver the environmental promises (WAGNER & HANSEN, P.774, 2005). Therefore, the author feels, that with the economic downturn, and without sufficient drivers in the market and financial incentives, it is difficult for companies justify using resources on trying to compete in market that has not been properly indentified yet. As stated in Wagner and Hansen (2005), more applied research is needed to enhance understanding of who the "green consumers" are, which products they favour, where they buy them, when they do so, why they choose those they do, and how they are influenced by such extraneous variables as word of mouth, publicity, media advertising, sales promotion, merchandising display, store image, and so forth (WAGNER & HANSEN, P.785, 2005).

Development of sustainable design guidelines for the incorporation of 'green' or sustainable design in the Irish furniture and wood products industry

Through the author's primary and secondary research, she concluded that a sustainable design certification specific to the furniture and wood products industry would be helpful manufacturing tool. As the development of an entire certification would require a much longer study than was available in the scope of this minor thesis, the author drew up a set of guidelines that could be used as a base point for potentially developing a sustainable certification process for the Irish furniture and wood products industry.

Seven fundamental core principles for this sustainable guideline have been identified by the author. They are as follows:

1. End of life – recycling

2. 'Green' Credentials

3. Sustainable harvesting

4. Sustainable Material Choices

5. Sustainable Engineering

6. Education & Outreach

7. Marketing & Branding

The author expanded each principle into a guideline and feels that there would be many benefits in implementing such a guideline. There are also some disadvantages to implementing such a process, including the current recession, cost of training and the lack of market drivers and incentives.

Possible internal benefits of implementing the guidelines are demonstrated environmental responsibility, becoming an industry leader, enhancing quality and investment in people system, enhancing quality of management and improvement of training level and staff morale. However the author also notes that there are some disadvantages associated with implementing such guidelines such as, higher than usual staff training costs and investing in capital expenditure may be required.

The author concludes that there is uncertainty about value/promotion of 'sustainable certification' in market place and coupled with lack of financial state support to implement such initiatives

7.3   Recommendation for further study

The author concluded that a sustainable design certification, specific to the furniture and wood products industry, would be useful to evoke consumer trust and confidence in a product's 'green' credentials. As the development of an entire certification would require a much longer study than was available in the scope of a three month minor thesis, the author proposed a sustainable design guideline suitable for the furniture and wood products industry. The author recommends that further work could be derived from this study developing this concept and perhaps cumulating in an entire certified sustainable design process for the furniture and wood products industry.

Further to this, a growing number of consumers are actively seeking environmentally friendly merchandise (WAGNER & HANSEN, P.773, 2005). Multiple factors are found to influence consumers in their adoption of "green" purchasing and it is difficult to ascertain if this is through specific product categories, geographical boundaries, or even through the medium via which the green message is transmitted (WAGNER & HANSEN, P.773, 2005). Therefore, the author also suggests that the whole area of 'green' consumerism warrants further examination, as it is becoming an increasingly important market driver. As detailed in the summary of chapter five, the major case study, the author found that it is very hard for manufacturers to invest resources in developing a product, when they do not have enough information on who their customer is and what aspects of sustainability the consumer is looking for in a product.

The participants in the focus group came to the mutual agreement that they would like to meet again this September to discuss starting an 'Irish Wood Federation Alliance'. This 'principles based alliance' would be made up of core principles to give an advantage to companies that want to implement 'green' techniques. This would be a type of umbrella network of Irish furniture designers and manufacturers, who all want to invest in sustainability and want to build a brand associated with value and strong sustainable principles. The author suggests that the 'Green Dot' brand or logo could be used to market this umbrella network of Irish furniture designers and manufactures and that the 'Green Dot' could be further developed into a marketing brand to encompass various different types of sustainably manufactured products in the future.

Bibliography

- Carson, R., *Silent Spring,* 1962, Houghton Mifflin Company, New York
- Dobson, A., *Green Political Thought,*1990, Routledge – Taylor & Francis Group, London & New York
- http://www.c2ccertified.com/
- http://www.goodfactories.com/
- http://www.ecobuild.co.uk
- http://www.greencabinetsource.org/
- http://www.inbuilt.co.uk/html/home.htm
- http://www.kcma.org/
- http://www.epa.gov/epp/
- http://www.forestprod.org/
- http://www.na.fs.fed.us/werc/
- http://www.nari.org/
- http://new.sustainablefurnishings.org/
- http://www.pefc.co.uk/
- http://www.retailenvironments.org/green/
- http://www.usgbc.org/
- www.valuecreatedreview.com
- http://www.woodforgood.com/
- McDonough, W. & Braungart, M.,2001, *Cradle to Cradle: Remaking the way we make things*, Rodale Press, US

- Papanek, V., *The Green Imperative – Ecology and Ethics in Design & Architecture,* 1995, Thames & Hudson, UK
- Schumacher, E.F., *Small is Beautiful: Economics as if People Mattered,* 1973, Blond & Briggs, UK
- Whyte, I. D., *Climatic Change and Human Society,* 1995, Arnold Publishing, London
- Seddon, J., *'The Case Against ISO 9000',* Oak Tree Press, Dublin, 2000

References

- AIB – Allied Irish Bank, *'Case study on Teamwoodcraft',* 2008 - retrieved form the world wide web – 20th August 2010 – From: http://www.aib.ie/servlet/BlobServer/Team%20Woodcraft.pdf?blobcol=urldata&blobheader=application/pdf&blobkey=id&blobtable=MungoBlobs&blobwhere=1212665543848&csblobid=1207155368843

- Alison, B., O'Sullivan, T., Owen, A., Rice, J., Rothwel, A. & Saunders, C., *'Research Skills for Students',* Kogan Page Limited, London, 1998

- Barnes, P.M. & Barnes, I.G., *'Environmental Policy in the European Union',* Edward Elgar Publishing, UK & USA, 1999

- Barrrow, C.J., *'Environmental Management Principles and Practice',* Routledge Taylor & Francis Group, London & New York, 2005

- Beard, C. & Hartmann, R., *'Naturally enterprising – eco-design, creative thinking and the greening of business products',* European Business Review, Vol. 97, No. 5, pp. 237–243, 1997

- Booth, D.E., *'The Environmental Consequences of Growth',* Routledge, London & New York, 1998

- British Standards Online, n.d., retrieved from the world wide web, August 21st 2010, from: http://www.bsonline.bsi-global.com/search/results/1

- BSI, *'BS 16000:2009 Standard'*, 'Energy management systems — Requirements with guidance for Use British Standards Institute', pdf, 2009

- Castlebrook, *'Castlebrook Furniture'*, 2010, from the world wide web, August 21st 2010, from: http://www.castlebrook.ie/index.html

- *'Castlebrook Furniture + Design'* [Image], 2010 - retrieved from the world wide web – 12th April 2010 – http://www.castlebrook.ie/

- *'Charles Furniture'* [Image], 2010 - retrieved from the world wide web – 12th April 2010 – http://www.charlesfurniture.ie/

- Cradle to Cradle®, n. d. retrieved from the world wide web, August 21st 2010, from: *http://mbdc.com/detail.aspx?linkid=2&sublink=8*

- DCMNR, Department of Marine & Natural Resources, *'Government White Paper – Delivering a sustainable energy future for Ireland'*, The Energy Policy Framework 2007-2020, Dublin, 2007, Retrieved from the world wide web from: http://www.dcenr.gov.ie/NR/rdonlyres/54C78A1E-4E96-4E28-A77A-3226220DF2FC/27356/EnergyWhitePaper12March2007.pdf, 9th April 2010

- DEHLG – The Department of Environment, Heritage & Local Government, *'The National Climate Change Strategy 2007-2012'*, PRN: A7/0397, Customs House, Dublin 2007 - retrieved form the world wide web – 20th February 2010 – From: http://www.environ.ie/en/Environment/Atmosphere/ClimateChange/NationalClimateChangeStrategy/PublicationsDocuments/FileDownLoad,1861,en.pdf

- *'Dolls house'*, [Image], n.d. - retrieved from the world wide web – 12th August 2010 – From: http://www.hometimecrafts.co.uk/blog/uploaded_images/HT-LDH-784709.jpg

- Dowie, T., 'Green Design', World Class Design to Manufacture, Vol. 1, No. 4, pp. 32-38, MCB University Press, UK,1994

- *'Dublin Castle'*, [Image], n.d. - retrieved from the world wide web – 1[2th] August 2010 – From: http://www.carhirex.com/sites/carhirex.com/files/content/dublin_castle.jpg

- Enterprise Ireland *'About us'*, 2010 - retrieved from the world wide web – 12th August 2010 – From: http://www.enterprise-ireland.com/en/About-Us/

- *'Enterprise Ireland'*, [Image], 2010 - retrieved from the world wide web – 12th August 2010 – From: http://www.enterprise-ireland.com/en/About-Us/

- Europa, 'Tackling Climate Change', European Union Commission, EU Legislation, 2006 – Retrieved from the world wide web - from: http://europa.eu/legislation_summaries/environment/tackling_climate_change/l27062_en.html, 10th April 2010

- Finline, *'Finline Furniture'*, 2010, Retrieved from the world wide web, 10th August 2010 – from: http://www.finlinefurniture.ie/aboutus.asp?cid=2

- *'Finline Furniture'* [Image], 2010 - retrieved from the world wide web – 12th April 2010 – http://www.finlinefurniture.ie/

- FIRA – Furniture industry research association, *'Sustainable design in the UK office furniture sector - a scoping study'*, UK, 2002

- Fitzgeralds, 'Fitzgeralds-About Us', 2010, Retrieved from the world wide web, 10th August 2010 – from: http://www.fitzgeraldsofkells.com/index.htm

- *'FitzGerald's of Kells'* [Image], 2010 - retrieved from the world wide web – 12th April 2010 - http://www.fitzgeraldsofkells.com/

- *'Green dot'* [Image], 2010 - retrieved from the world wide web – 12th September 2010 – From:http://www.google.ie/imgres?imgurl=http://us.123rf.com/400wm/400/400/rabbit/rabbit0901/rabbit090100044/4153638.jpg&imgrefurl=http://www.123rf.com/photo_4153638.html&usg

- *'GMIT Letterfrack'*, [Image], 2010 - retrieved from the world wide web – 12th August 2010 – From: http://www.letterfrack.net/

- *'Google'*[Image], *'Carbon footprint'*, n.d. - retrieved from the world wide web – 12th September 2010 – From:
http://www.google.ie/imgres?imgurl=http://muttondressedaslamb.files.wordpress.com/20

09/12/carbonfootprint.jpg&imgrefurl=http://muttondressedaslamb.wordpress.com/2009/1 2/10/carbon-capture/&usg

- *'Google'*[Image], *'Education & outreach'*, n.d. - retrieved from the world wide web – 12th September 2010 – From: http://www.google.ie/imgres?imgurl=http://www.free-graphics.com/clipart/Holidays/graduation-cap.jpg&imgrefurl=http://www.free-graphics.com/clipart/Holidays/graduation-cap.shtml&usg

- *'Google'*[Image], *'End of life'*, n.d. - retrieved from the world wide web – 12th September 2010 –From: http://www.google.ie/imgres?imgurl=http://www.thenewgreenblog.com/wp

- *'Google'*[Image], *'Marketing & branding'*, n.d. - retrieved from the world wide web – 12th September 2010 – From: http://www.google.ie/imgres?imgurl=http://www.istockphoto.com/file_thumbview_appr ove/10525240/2/istockphoto_10525240-round-stamp-with-text-100-eco-friendly.jpg&imgrefurl=http://www.istockphoto.com/stock-photo-10525240-round-stamp-with-text-100-eco

- *'Google'*[Image], *'Sustainable engineering'*, n.d. - retrieved from the world wide web – 12th   *September*   *2010*   –   *From:* http://www.google.ie/imgres?imgurl=http://philiptownsend.co.uk/files/cog.jpg&imgrefurl =http://www.philiptownsend.co.uk/index.php%3F/project/political-posters/&usg

- *'Google'*[Image], *'Sustainable harvesting*, n.d. - retrieved from the world wide web - 12th September 2010 – From: http://www.google.ie/imgres?imgurl=http://thumb15.shutterstock.com.edgesuite.net/displ ay_pic_with_logo/51142/51142.1182857967.1/stock-photo-axe-thrust-in-a-log

- *'Google'*[Image], *'Sustainable materials'*, n.d. - retrieved from the world wide web – 12th September 2010 – From: http://www.google.ie/imgres?imgurl=http://www.sherwoodhealth.com/images/Tree-logo.jpg&imgrefurl=http://www.sherwoodhealth.com/&usgbbbb

- Gradel, T. E., *'Streamlined Life-Cycle Assessment'*, Prentice-Hall Inc, New Jersey, USA, 1998

- Gradel, T.E. & Allenby, B.R., *'Industrial Ecology and Sustainable Engineering'*, Pearson, Prentice-Hall Inc, New Jersey, USA, 2010

- Hickey, K., *'Five Minutes to Midnight? – Ireland & Climate Change'*, The White Row Press, Belfast, 2008

- Hillary, R., *'SME's and Experiences with Environmental Management Systems'*, Journal of Cleaner Production, Vol. 12, No. 6, August 2004, Pages 561-569. Retrieved March 27th from Science Direct data base

- Holliday, C., Schmidheiny, S. & Watts, P, *'Walking the Talk: The Business Case for Sustainable Development'*, Berrett-Koehler Publishers, San Francisco, CA., 2002

- Holt, D. & Ghobadian, A., *'An empirical study of green supply chain management practices amongst UK manufacturers'*, Vol. 20, No. 7, pp. 933-956, Emerald Group Publishing Limited, UK, 2009

- IEA, International Energy Agency, 'About Us', retrieved from the world wide web, 24th March, 2010 - from: http://www.iea.org/about/index.asp

- *IPCC report on global climate change,* 2007 - retrieved form the world wide web – 20th February 2010 - from: http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-spm.pdf

- I.S. 393:2005, *'Energy Management Systems Technical Guideline'*, Sustainable Energy Ireland, 2006

- *ISO 9000:2008,* - 'ISO 9000' - retrieved from the world wide web – 28th March 2010 - from: http://en.wikipedia.org/wiki/ISO_9000

- IT Carlow, *'Staff profiles – Adam DeEyto'*, 2010 - retrieved from the world wide web – 12th August 2010 – From: http://www.itcarlow.ie/rd_researchers_det.asp?top_section=2&lower_section=12&lower2_section=50&id=40

- Hubpage, *'Basic Terminology of Energy Management'*, definition, – Retrieved from the world wide web, 10th April 2010 - from: http://hubpages.com/hub/Basic-terminology-of-energy-management

- *'Institute of Technology, Carlow'* [Image], 2010 - retrieved from the world wide web – 1[2th] April 2010 - http://www.itcarlow.ie/

- ISO 14001 :1996, *'Environmental Management Systems – Specifications of Guidance for Use'*, European Committe for Standarisation, 1996

- Jordan, A., *'Environmental Policy in the European Union – Actors, Institutions & Processes'*, Earth scan, London, 2002

- Laois Nationalist, *'Finline Furniture'*, 2008 - retrieved from the world wide web – 12th August 2010 – From: http://archives.tcm.ie/laoisnationalist/2008/01/10/story27306.asp

- McNeill, J., *Something New Under the Sun – An Environmental History of the Twentieth Century*, 2000, Penguin Books London & New York

- N.A., *'Peak Oil'*, Article - retrieved from the world wide web – 12th April 2010 – From: http://en.wikipedia.org/wiki/Peak_oil

- No author, *'Supersize this: McDonald's and the sustainability story: Where are the environmental leaders, messages and profits?'*, Strategic Direction, Vol. 26, No. 9, pp. 29-32, Emerald Group Publishing Limited, 2010

- Mohanty, R. P. & Deshmukh, S.G., *'Managing green productivity: a case study'*, Vol. 48, No. 5, pp. 165-169, Emerald Group Publishing Limited, 1999

- Morgan, D.L., *'Focus Groups as Qualitative Research'*, Second Edition, Sage Publications, Inc., California, USA, 1997

- Orna, E., & Stevens, G., *'Managing Information for Research'*, Open University Press, Buckingham, UK, 1995

- Phau, I., & Ong, D., *'An investigation of the effects of environmental claims in promotional messages for clothing brands'*, Marketing Intelligence & Planning, Vol. 25, No. 7, pp. 772-788, Emerald Group Publishing Limited, Australia, 2007

- Rahim, A.R.A. & Baksh, M.S.N., *'Case study method for new product development in engineer-to-order organizations'*, Vol. 52, No. 1, Emerald Group Publishing Limited, Johor, Malaysia, 2003

- Sanchez, K.E., *'Green Movement in Business'*, Nova Science Publishers, Inc., New York, 2009

- *SEAI* – Sustainable Energy Ireland, *'Energy management systems I.S. 393:2005 – Technical guide'* - retrieved from the world wide web – 20th August 2010 – From: http://www.seai.ie/Your_Business/Energy_Agreements/IS393_Energy_Management_Sys tem/IS393_Technical_guideline_Final.pdf

- Sustainable Furnishings Council, 'About us', 2010 - retrieved from the world wide web – 20th August 2010 – From: http://www.sustainablefurnishings.org/

- Strong, C., *'The problems of translating fair trade principles into consumer purchase behaviour'*, Marketing Intelligence & Planning, pp. 32-37, Wales, UK, 1997

- Tammela, I. & Canen, A.G., *'Time-based competition and Multiculturalism: A comparative approach to the Brazilian, Danish and Finnish furniture industries'*, Vol. 46 No. 3, pp. 349-364, Finland, 2008

- *'Swan rocker'*, [Image], n.d. - retrieved from the world wide web – 12th August 2010 - From: http://ecx.images-amazon.com/images/I/41uRynZhrzL.jpg

- Taylor, G., 'Conserving the Emerald Tiger – The Politics of Environmental Regulation in Ireland', Arlen House, Galway, 2001

- *'Teamwoodcraft Ltd'* [Image], 2010 - retrieved from the world wide web – 12th April 2010 – http://www.teamwoodcraft.com/aboutus.html

- *'Thatched cottage'*, [Image], 2010 - retrieved from the world wide web – 12th August 2010 – From: http://www.conorscottage.com/

- TRADA, *'Sustainable timber sourcing: Certified timber products, Section 2/3 Sheet 58, Subject: Timber'*, June 2007, TRADA Technology, UK

- Tuttle, T. & Heap, J., *'Green productivity : moving the agenda'*, International Journal of Productivity and Performance Management, Vol. 57, No. 1, pp. 93-106, Emerald Group Publishing Limited, UK, 2008

- U.S. Green Building Council, 'LEED intro', 2010 - retrieved from the world wide web – 20th August 2010 – From: http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988

- Victor, D.G. & Culllenward, D., *'Making Carbon Markets Work'*, Scientific American, December 2007

- *'Volkswagen Van'*, [Image], n.d. - retrieved from the world wide web – 12th August 2010 – From: http://www.3dexport.com/models/14720/14415/vw_van0001.jpg

- Wagner, E. R. & Hansen, E. N., *'Innovation in large versus small companies: insights from the US wood products industry',* Vol. 43, No. 6, pp. 837-850, Emerald Group Publishing Limited, USA, 2005

- Watson, B. & Associates, 2010, 'What is ETO / Project-based Manufacturing?' - retrieved from the world wide web – 20th August 2010 – From: http://www.bwatsonassociates.com/Content/What%20is%20ETO%20Manufacturing.pdf

- Woodforgood, *'Certifications'*, 2010, - retrieved from the world wide web – 20th August 2010 – From: http://www.woodforgood.com/certification.html

- Yin, R.K., *'Case Study Research : Design and Methods'*, 2nd edition, Sage publications, London, 1994

Appendix 1

- Focus Group Invitation

- Focus Group Agenda

GMIT Letterfrack
GALWAY-MAYO INSTITUTE OF TECHNOLOGY INSTITIÚID TEICNEOLAÍOCHTA NA GAILLIMHE-MAIGH EO
A GMIT / CONNEMARA WEST PARTNERSHIP   **The Furniture College**

Focus Group Agenda

Date: Monday, 5th July 2010   **Time:**   10.30 am

Venue: Enterprise Ireland,   The Plaza, Eastpoint Business Park,   Dublin 3

Agenda:

- o   10.30 am – 10.40 am – Welcome Note & Introductions
- o   10.40 am - 12.30 pm – Discussion
- o   12.30 pm – Session Closing
- o   12.40 pm – Lunch

For Discussion:

'Green Furniture - A Sustainable Design Process for Furniture and Wood Products'

- o   How are Irish furniture & wood product companies currently dealing with sustainability in design and manufacture?

- o   Why would you be interested in 'green' or 'sustainable' design going forward?

- o   How would you like to see a sustainable design process implemented - new certification system or integrated approach based on existing certifications?

Facilitator:

- o   Pamela Browne – Research & Development, GMIT Letterfrack

In Attendance:

- o   Dermot O'Donovan (Head of Dept) & Dr. Patrick Tobin, GMIT Letterfrack
- o   Enterprise Ireland Development Advisors, Consumer Retail Markets Department

Participants:

- o   Aisling & Liam Hurley - Team Woodcraft, Co. Laois
- o   John Fitzgerald – Fitzgearlds of Kells, Co. Meath
- o   Joe Friel   - Castlebrook Furniture & Design, Co. Wicklow
- o   Ciaran Finane – Finline Furniture , Co. Offalye
- o   Dr. Adam DeEyto - Lecturer in Industrial & Product Design, Carlow
- o   Charles O'Toole – Charles Furniture, Dublin

127

Focus Group ¦INVITATION

For Discussion:

'Green Furniture - A Sustainable Design Process for Furniture and Wood Products'

The development of 'sustainable' furniture and wood products for new markets has recently become a priority for Irish manufacturers. In the last ten years most Irish manufacturers have developed as project-based businesses heavily dependent on the construction (new-build and refurbishment) market. They have generally competed on the basis of quality, flexibility and reliability rather than price. With the collapse of the construction market, many manufacturers are looking for potential markets that value these competitive qualities. Therefore 'sustainable' products are regarded as high potential for Irish manufacturers because customers are seen as less price-sensitive than in other areas of the market.

GMIT Letterfrack has recently undertaken a project on behalf of Team Woodcraft, Co. Laois, to design, develop and manufacture a range of 'eco-friendly' children's furniture. Following on from this experience we are developing a sustainable design process specifically for the furniture and wood products. We would like to get your views on the whole area of sustainability, its relevance and application in our sector, and how the Irish Furniture and Wood Products sector is dealing with sustainability in design and manufacture.

Facilitator:

Pamela Browne – Research & Development, GMIT Letterfrack

In Attendance:

- Dermot O'Donovan (Head of Dept) & Dr. Patrick Tobin, GMIT Letterfrack
- Enterprise Ireland Development Advisors, Consumer Retail Markets Department
- Leading Irish furniture and wood product designers and manufacturers

Date :	Monday 5th July 2010
Venue:	Enterprise Ireland, The Plaza, Eastpoint Business Park, Dublin 3.
Time:	10.30 am – 12.30 pm - followed by light lunch
RSVP:	*Please RSVP your confirmation of attendance by Friday 25th June 2010 to pamela.browne@gmit.ie*

128

Appendix 2

- Concept Development of case study
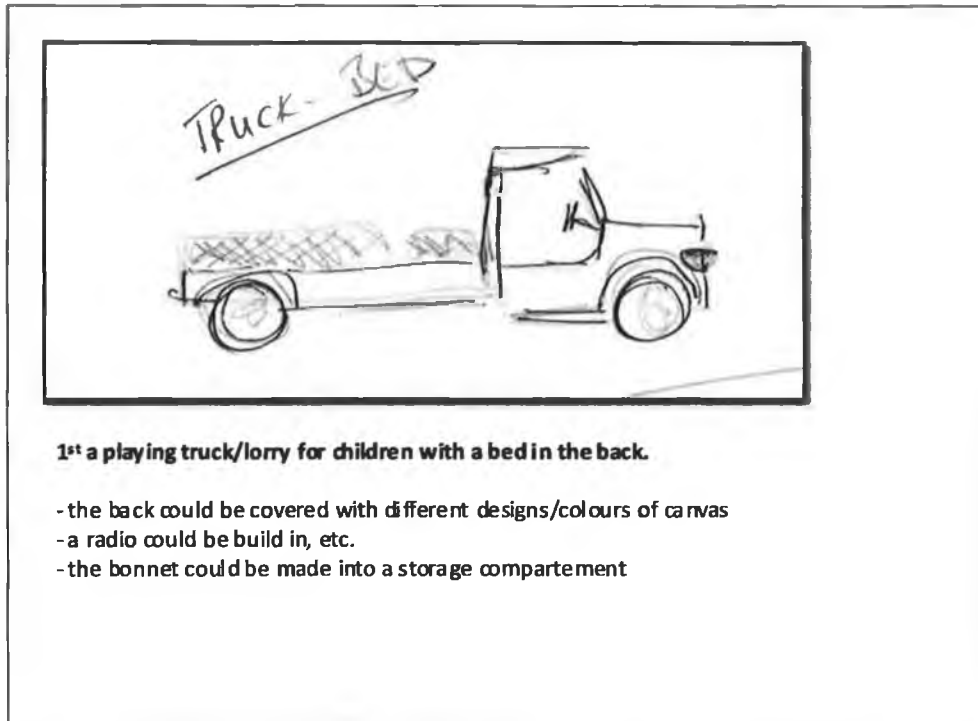
- Prototype of case study

- Final solution

1ˢᵗ a playing truck/lorry for children with a bed in the back.

- the back could be covered with different designs/colours of canvas
- a radio could be build in, etc.
- the bonnet could be made into a storage compartement

Figure 42 – Truck bed © Jens Kosak 2010

3ʳᵈ a bed that grows with the child

- "boxes" can be stacked to make a cot bed
- when the child grows the "boxes" can be transformed into a small bed and later into a full sized bed
- very sustainable
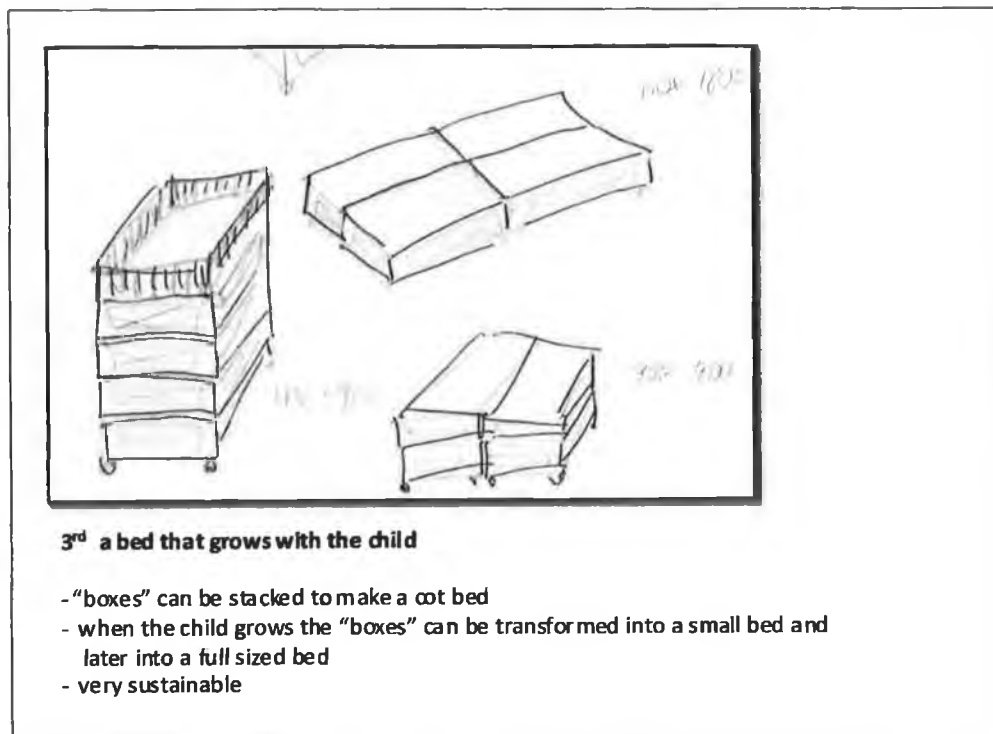
Figure 43 – Growing bed © Jens Kosak 2010

4th historical/ famous Four-poster-beds could be produced as miniature versions
- Potential heirloom
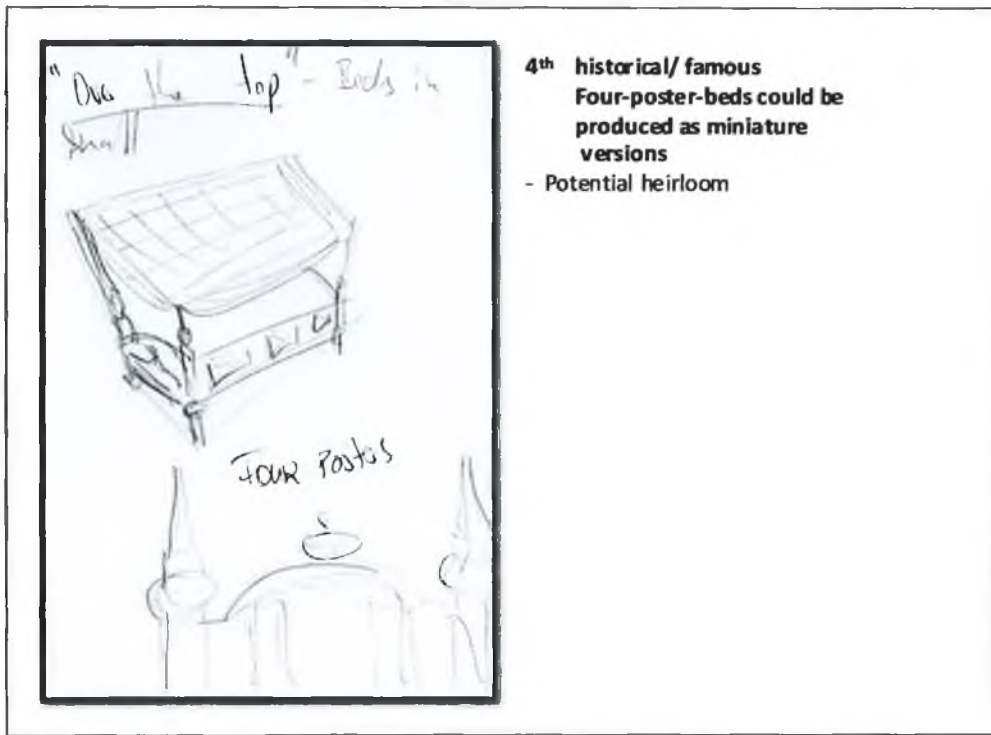
Figure 44 – Miniature four poster bed © Jens Kosak 2010

Van- Bed

Made of hardwood and bend plywood

With a curtain on the side to close the van and storage compartments in the sides
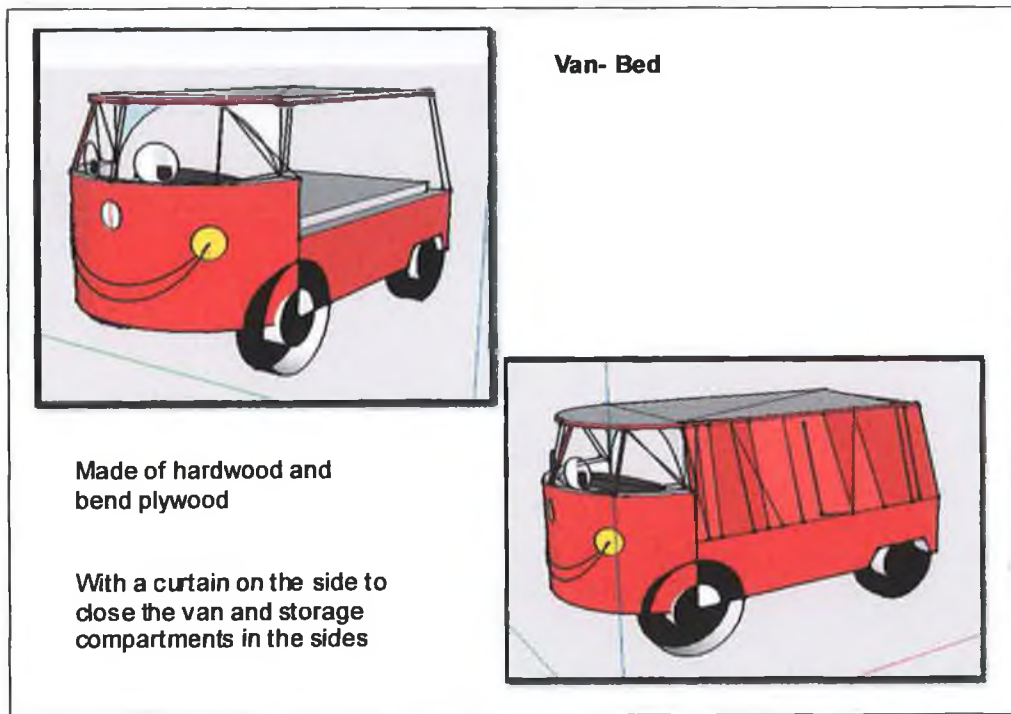
Figure 45 – Van bed © Jens Kosak 2010

Colour choices
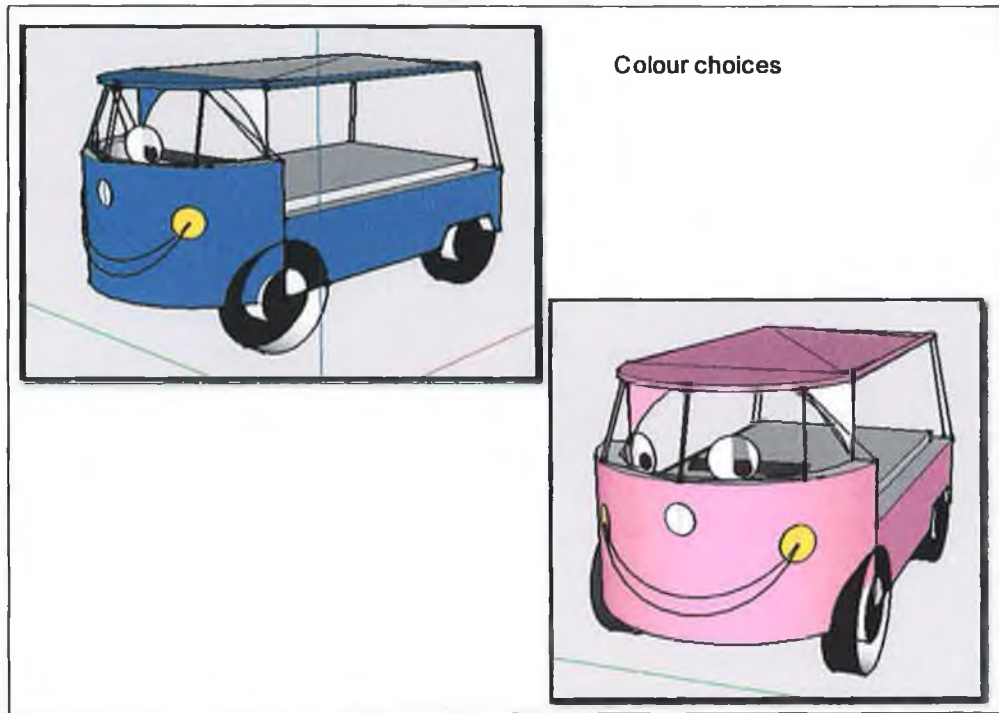
Figure 46 – Van bed © Jens Kosak 2010

Made from solid wood and some veneered board materials a high quality product could be fabricated. The rims/wheels might be fabricated with turned spokes.
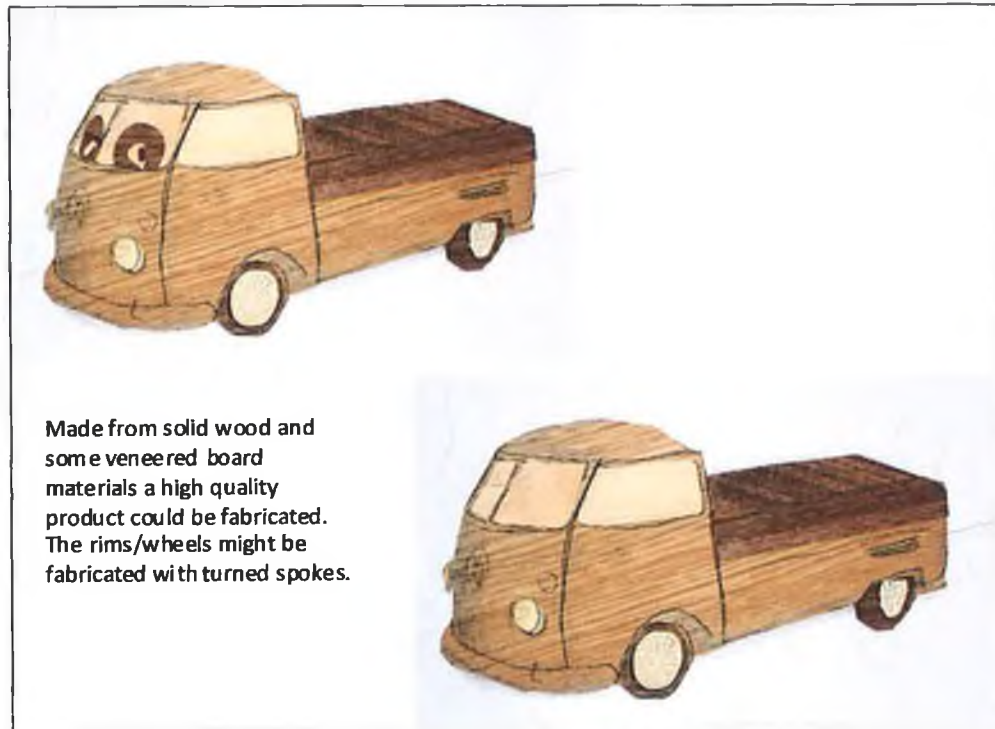
Figure 47 – 2D model VW © Jens Kosak 2010

Another idea I had are rocking animals that rock on their belly. I think this is quite innovative and has not been done before. These could be made out of solid wood at a very high quality. A Dino, Tortoise, Dolphin or Rubber Duck could also be suitable.
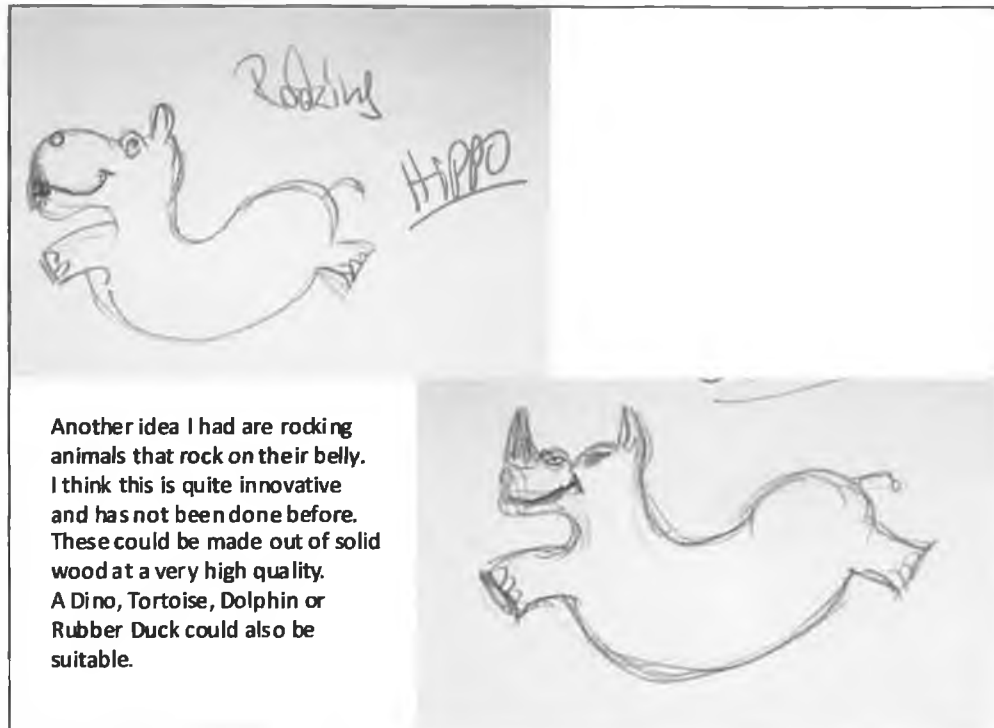
Figure 48 – Hippo rocker © Jens Kosak 2010

Multi-Bed
First it is a high cot with raised sides for newly born
When the babies get older the bed is turned around but the side are still raised
Later these canvas sides can be removed and attached to the ceiling of the now four-poster-bed
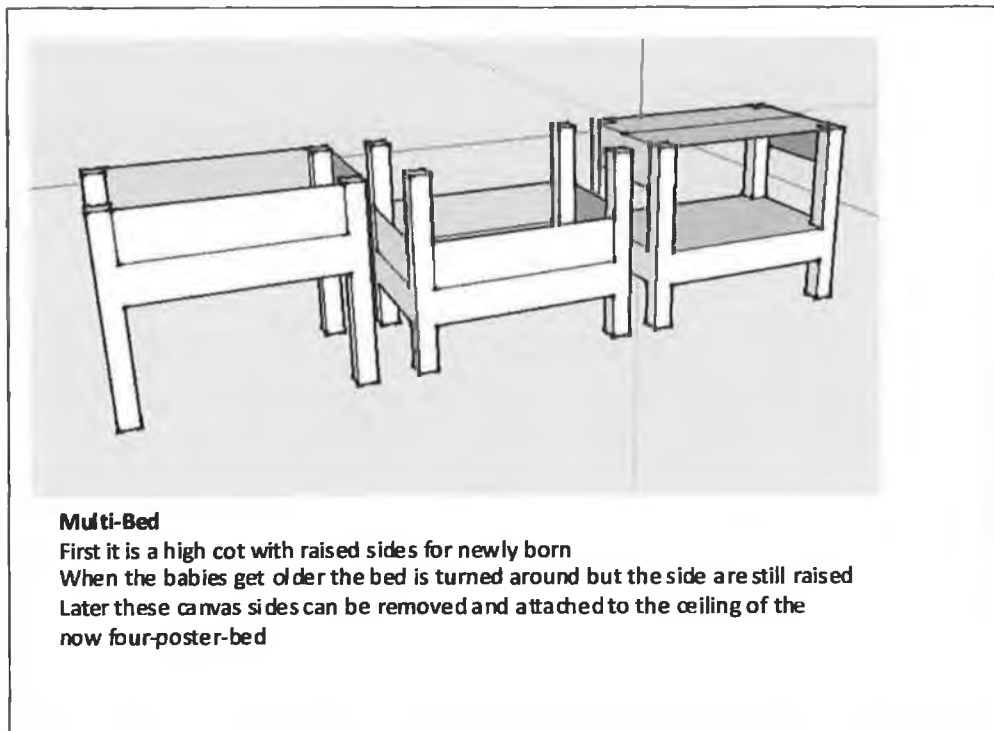
Figure 49 – Multibed © Jens Kosak 2010

The construction method I came up with incorporates a classic frame carcass into the design. That means that the chimney and the sides of the roof (which is so typical for Irish houses) are part of the constructional frame. That saves material and has a very high quality look.

I know it is an English Phone booth, red is just better in the image.
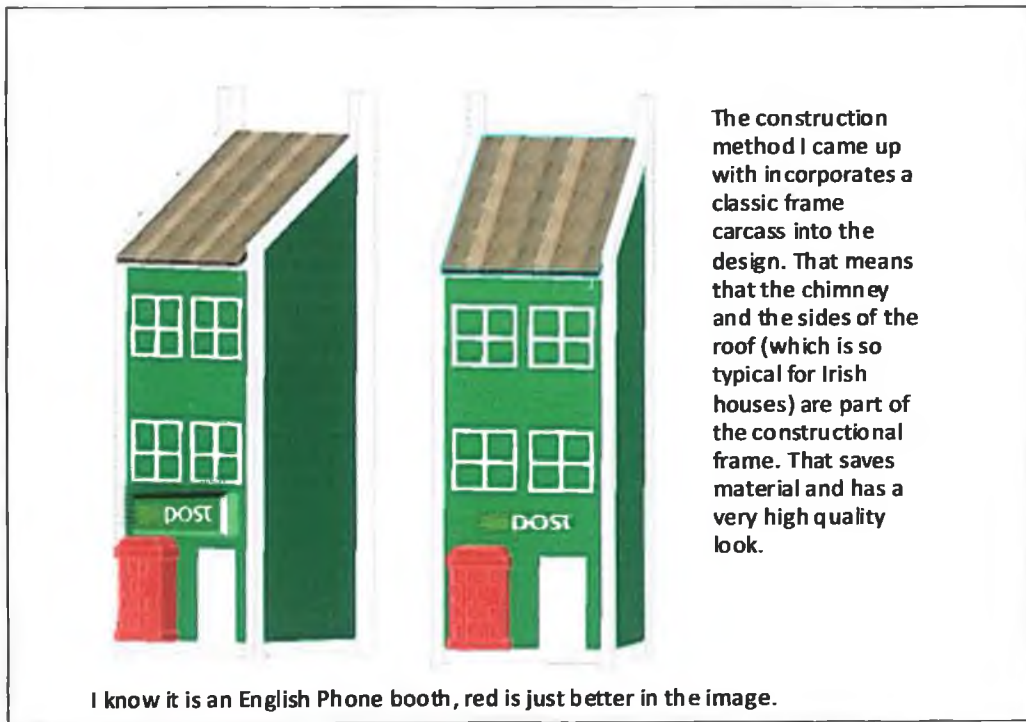
Figure 50 – Carcass construction © Jens Kosak 2010

To help develop correct proportions for the construction of the doll's houses, 1:1 drawings were developed:

Figure 51 – 1:1 drawing of doll's house © Jens Kosak

Figure 52 – Prototype – elevation & end view © Evan Prendergast 2010

Figure 53 – Prototype – open roof © Evan Prendergast 2010

Figure 54 – Photos of final solution prototype