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The Place To Be

END OF LIFE FURNITURE SUSTAINABILITY

Jennifer Critchlow
Skills Victoria/ISS Institute TAFE Fellowship

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ISS Institute Inc.
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Executive Summary

Most of the upholstered furniture currently being manufactured in Australia is constructed in a time-consuming, labour-intensive way using a multitude of components. The complexity of construction and difficulty in separating individual components makes this style of furniture impossible to recycle.

End of life (EOL) is often when the fabric wears, becomes soiled, or the owner follows the next fashion trend and the whole piece is then sent to landfill. It is generally more expensive to remove the cover to re-upholster than it is to start from new, because of the labour costs.

Every year there is more and more furniture on roadsides, put out for collection, to end up as landfill. In this decade of sustainability where the global demand to stop wasting natural resources and to reduce pollution is greater than ever before, the Fellow believes that this is inexcusable and the trend must be halted.

By introducing skills to the local industry that will enable them to produce better quality, longer lasting furniture and covers that can be laundered or replaced, we will not only help them be more competitive on the global market but we will also be reducing the energy used to manufacture 'disposable' furniture.

Education in sustainability, not as a philosophical concept but as an economic imperative and social benefit, is just now becoming available as part of the National Training Initiative.

We must educate the furnishing industry on sustainability by encouraging and funding enrolments for existing practitioners, management and new entrants in the new units included in the current Furnishing Industry Training Package LMF02.

It is also essential that the Australian furniture industry determine the world's best current practices in producing and re-manufacturing or recycling sustainable furniture, undertake ongoing research and provide access to online information dealing with the latest in sustainable manufacturing practices undertaken by industry associations.

A database of accessories/attachments/adjuncts of the new methods of construction to extend the life of upholstered furniture is required. Knowledge of construction methods for different styles of covers and fabrics could be complied by the Furniture Industry Association of Australia (FIAA) to fund and construct a website and maintain a database of fittings, fixings and construction methods for upholstered furniture.

A knowledge of fabrics for sustainable furniture, a database of material sources, methodologies to measure the carbon footprint, and the underpinning skills related to the cradle-to-cradle concept for all materials should be developed. This information could be available on the industry association website and this could then link to other websites specialising in sustainable fabrics and materials, such as www.geca.com.au. Submission should be sought by the FIAA and added to their website indentifying appropriate new materials discovered along the entire supply chain of furniture products.

Links should also be included in the FIAA website regarding new adhesives as they become available, referencing comments from those who have used them. Digital technology can provide a tool through which information can be shared such as appropriate adhesives for different upholstery applications, appropriate products and the range where selection is determined by cost versus sustainability factors.

Executive Summary

It is currently difficult to gain skills and knowledge in training and assessment in the application of sustainability practices in the Australian upholstery industry. All furnishing teachers should be encouraged to enrol in sustainability units, which would enable further development of the units of competency endorsed by the National Centre for Sustainability, and further development of a Learner's Guide for Certificate III in Upholstery (Apprenticeship Course).

The Australian furnishing industry, soft furnishing manufacturers, upholstered furnishing manufacturers, upholsterers, furniture retailers, interior designers, furniture designers and furnishing industry teachers are the industry sectors and occupations targeted by this report.

Whilst in the USA the Fellow travelled to Detroit, Michigan. There she met with and interviewed fellow teachers at the College for Creative Studies; a premier US design institute, especially in the motor vehicle area. They had a stunning materials library. Herman Miller Inc of Holland, Michigan, the world leaders in sustainable design and manufacture, particularly in task furniture, also made the Fellow most welcome. They have a database for all materials they have in use or in testing. All their office chairs have a 12-year three-shift guarantee, which speaks of tremendous quality control, as well as impressive recyclability. They introduced the Fellow to the concept of 'take-back', which means the producer accepts responsibility for re-use/disposal at the EOL.

The U.K. visits included London Metropolitan University to discuss training in the furniture area. Unfortunately, the training available in the UK furnishing industry is in even more decline than here. Their apprenticeship system is also becoming redundant. Most training is entered into by older women, either as a hobby or with a view to starting an interior design shop. The Fellow then went to the Furniture Industry Research Association in Hertfordshire, to look at legislative testing requirements for longevity, fit for use and fire-retardancy of material used in the furniture industry. Wendy Shorter Interiors in Hertfordshire gave the Fellow an insight into the current market trends and training in the UK, and LynPlan of Croydon, specialists in loose cover construction, were very generous in sharing techniques and fixings.

Whilst in Italy, Herman Miller in Milan introduced the Fellow to the best furniture shops in the city. The Fellow visited AntiDiva in Lombardy, Living Divani in Como, and then moved south to Tuscany to visit Dema in Certaldo and Segis SpA in Poggibonsi. All four of these small manufacturers are making high quality furniture using injection moulded foam over steel frames and covered in natural fibres or leather, to exquisite standards of cut, fit and finish. Nearly all frames are made outside the factory, except at Segis SpA, which started as an engineering business and later developed the upholstered furniture side. All had an acute awareness of the importance of not polluting and minimising waste as being part of a manufacturer's responsibilities. Although they were not strictly aware of it, re-using their covers fitted into the sustainability model, even though they were doing it because of market demand. Many Europeans would no sooner lie on a lounge for a year without laundering the covers than they would lie on unwashed bed sheets. This was an eye-opener for the Fellow.

Tangible benefits for the industry, for occupations in the furniture trade, and the Fellow's vocational enhancement are centred on how the skills are to be shared with others in Australia, and this report contains recommendations to be made to Federal, State and Local Government as appropriate.

Recommendations are also made regarding proposed actions to be taken by the industry itself, professional associations and education and training organisations.

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Abbreviations and Acronyms

AQTF	Australian Quality Training Framework
BIFMA	Business and Institutional Furniture Manufacturer's Association
CEO	Chief Executive Officer
CNC	Computer Numerically Controlled
COSBOA	Council of Small Businesses of Australia
CRICOS	Commonwealth Register of Institutions and Courses for Overseas Students
DfE	Design for the Environment
EBPPP	Enterprise Based Productivity Places Program
EOL	End of life
EPA	Environmental Protection Agency (USA)
EPR	Extended Producer Responsibility
FIAA	The Furnishing Industry of Australia
FIAA (Vic/Tas)	The Furnishing Industry Association of Australia (Vic/Tas)
FR	Fire Retardant
FURNITAC	Furnishing Industry Training Advisory Committee
FurnTAG	Furnishing Teachers' Advisory Group
USGBC	U.S. Green Building Council
HM	Herman Miller Inc
ISS Institute	International Specialised Skills Institute
ITAB	Industry Training Advisory Board
JIT	Just-In-Time
LCA	Life Cycle Assessment
LEED	Leadership in Energy and Environmental Design
MSA	Manufacturing Skills Australia

Abbreviations and Acronyms

OECD	Organisation for Economic Co-operation and Development
PET	Polyethylene Terephthalate
PVC	Polyvinyl Chloride
RMIT	Royal Melbourne Institute of Technology
RPL	Recognition of Prior Learning
RTO	Registered Training Organisation
SFC	Sustainable Furnishings Council
TAFE	Technical and Further Education
TDC	TAFE Development Centre
UNDESD	United Nations Decade of Education for Sustainable Development
UV	Ultraviolet

Definitions

Design	Design is problem setting and problem solving. Design is a fundamental economic and business tool. It is embedded in every aspect of commerce and industry and adds high value to any service or product—in business, government, education and training, and the community in general. Reference: 'Sustainable Policies for a Dynamic Future', Carolynne Bourne AM, ISS Institute 2007.
Innovation	Creating and meeting new needs with new technical and design styles. (New realities of lifestyle). Reference: 'Sustainable Policies for a Dynamic Future', Carolynne Bourne AM, ISS Institute 2007.
PET	Polyethylene Terephthalate is a plastic used to make food containers, etc.
Skill deficiency	A skill deficiency is where a demand for labour has not been recognised and training is unavailable in Australian education institutions. This arises where skills are acquired on-the-job, gleaned from published material or from working and/or studying overseas. Reference: 'Directory of Opportunities. Specialised Courses with Italy. Part 1: Veneto Region', ISS Institute, 1991. There may be individuals or individual firms that have these capabilities. However, individuals in the main do not share their capabilities, but rather keep the intellectual property to themselves. Over time these individuals retire and pass away. Firms likewise come and go.
Sustainability	The ISS Institute follows the United Nations for Non-Governmental Organisations' definition on sustainability: *"Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs".* Reference: http://www.unngosustainability.org/CSD_Definitions%20SD.htm

Acknowledgements

Jennifer Critchlow would like to thank the following individuals and organisations who gave generously of their time and their expertise to assist, advise and guide her throughout the Fellowship program.

Awarding Body – International Specialised Skills Institute (ISS Institute)

The International Specialised Skills Institute Inc is an independent, national organisation that for over two decades has worked with Australian governments, industry and education institutions to enable individuals to gain enhanced skills and experience in traditional trades, professions and leading-edge technologies.

At the heart of the Institute are our Fellows. Under the **Overseas Applied Research Fellowship Program** the Fellows travel overseas. Upon their return, they are required to pass on what they have learnt by:

1. Preparing a detailed report for distribution to government departments, industry and educational institutions.
2. Recommending improvements to accredited educational courses.
3. Delivering training activities including workshops, conferences and forums.

Over 180 Australians have received Fellowships, across many industry sectors. In addition, recognised experts from overseas conduct training activities and events. To date, 22 leaders in their field have shared their expertise in Australia.

According to Skills Australia's 'Australian Workforce Futures: A National Workforce Development Strategy 2010':

> Australia requires a highly skilled population to maintain and improve our economic position in the face of increasing global competition, and to have the skills to adapt to the introduction of new technology and rapid change.
>
> International and Australian research indicates we need a deeper level of skills than currently exists in the Australian labour market to lift productivity. We need a workforce in which more people have skills, but also multiple and higher level skills and qualifications. Deepening skills across all occupations is crucial to achieving long-term productivity growth. It also reflects the recent trend for jobs to become more complex and the consequent increased demand for higher level skills. This trend is projected to continue regardless of whether we experience strong or weak economic growth in the future. Future environmental challenges will also create demand for more sustainability related skills across a range of industries and occupations.[1]

In this context, the Institute works with Fellows, industry and government to identify specific skills in Australia that require enhancing, where accredited courses are not available through Australian higher education institutions or other Registered Training Organisations. The Fellows' overseas experience sees them broadening and deepening their own professional practice, which they then share with their peers, industry and government upon their return. This is the focus of the Institute's work.

For further information on our Fellows and our work see www.issinstitute.org.au.

[1] Skills Australia's 'Australian Workforce Futures: A National Workforce Development Strategy 2010', pp. 1-2 http://www.skillsaustralia.gov.au/PDFs_RTFs/WWF_strategy.pdf

Acknowledgements

Fellowship Sponsor

The Victorian Government, Skills Victoria is responsible for the administration and coordination of programs for the provision of training and further education, adult community education and employment services in Victoria and is a valued sponsor of the ISS Institute. Critchlow would like to thank them for providing funding support for this Fellowship.

Supporters

In validating the skills deficiencies, many conversations have taken place between the Fellow and members of industry skills councils and manufacturers. These include:

- Patrick Cummings, Manufacturing Skills Australia
- Bryon Stanley (ISS Institute Fellow), Chair, Furnishing Teachers' Advisory Group
- John Osmelak, General Manager, Furnishing Industry Association of Australia (FIAA Vic/Tas)
- Margot Spalding, General Manager, Jimmy Possum
- Julian Pratt (ISS Institute Fellow), Multidisciplinary Program Coordinator, School of Design (TAFE), Design and Social Context, RMIT University

All have provided valuable advice and letters of support.

In recent years, the furnishing industry in Australia has been decimated by many factors such as cheaper imports and poor manufacturing practices. Those companies that have weathered the storm are now seeking to reinvent themselves and are looking for points of difference that will provide sustainability and growth. The Fellowship enabled Critchlow to continue her quest to develop best-practice points of difference in upholstery—a traditional occupation that has suffered, and continues to suffer against the various factors that are impacting the furnishing industry.

Patricia Hughes, former ITAB Manager Forestry & Furnishing, ForestWorks stated that *"Jennifer has correctly identified those skill and knowledge deficiencies which, when addressed, will translate into those points of difference so eagerly sought, and needed, by the upholstery sector."*

Margot Spalding, the General Manager of Jimmy Possum, a major Australian manufacturer of upholstered product, which prides itself on an innovative approach in this industry indicated her support with the following statement. *"The importance of ensuring that knowledge gaps are identified and addressed in order that the craft of upholstery is afforded the development and expansion which it must have, and deserves, in order to maintain its skills base, is of critical important [sic] to the industry within this country".*

John Osmelak, the General Manager of the FIAA (Vic/Tas) stated *"I have read the application by Jennifer Critchlow and fully support the concepts contained therein. Sustainability is and will become in the future increasingly important to the upholstered furniture industry, and any skills deficiencies that can be closed in order to address the issue will be of great value to the industry."*

Acknowledgements

Specific Acknowledgements

- The Fellow acknowledges the support and encouragement of Carolynne Bourne (former CEO of ISS Institute) and the team at the ISS Institute
- Holmesglen Institute of TAFE
- Philip Ashley (ISS Institute Fellow), Manager of the Furnishing Industry Design and Innovation Centre, Holmesglen Institute of TAFE
- Bryon Stanley (ISS Institute Fellow), Chair of the Furnishing Teachers' Advisory Group, Furniture Design and Technology Teacher, Royal Melbourne Institute of Technology University (TAFE)

The Fellow would also like to thank the following people for supplying valuable contacts overseas:

For Contacts in the United Kingdom

- Martin Lewis, General Manager of the Furnishing Industry Association of Australia (FIAA)
- John Osmelak, General Manager, FIAA (Vic/Tas)
- Julian Pratt (ISS Institute Fellow), Multidisciplinary Program Coordinator, School of Design (TAFE), Design and Social Context, RMIT University

For Contacts in Germany

- Philip Ashley (ISS Institute Fellow), Manager of the Furnishing Industry Design and Innovation Centre (FIDIC), Holmesglen Institute of TAFE

For Enabling and Organising the Herman Miller Visit and Other USA Activities

- Imre Molnar, Dean, College for Creative Studies, Detroit, USA

Letters of Support

- John Osmelak, General Manager, FIAA (Vic/Tas) Inc
- Margot Spalding, General Manager, Jimmy Possum
- Patricia Hughes, ITAB Manager Forestry & Furnishing, ForestWorks
- Patrick Cummings, Manufacturing Skills Australia (MSA)
- Yvette Karklins, Wharington International.

Australian Organisations Impacted by this Report into the Upholstery Industry

Government

The Australian Federal Government has classified upholstery under the Commonwealth Register of Institutions and Courses for Overseas Students (CRICOS) classification, because of the skills shortage in this country. Manufacturing Skills Australia (MSA) is the industry skills council for the furnishing industry.

This report contains recommendations for improving training and manufacturing outcomes, and the Fellow believes that this information could help project future changes. Sustainability units have already been included in all trades under their umbrella.

Acknowledgements

Skills Victoria is responsible for funding of training offered to new apprentices and existing workers. Recognition of Prior Learning (RPL) will be developed and used to address identified skills deficiencies.

The TAFE Development Centre (TDC) can provide personal development to existing TAFE teachers and to design & technology teachers in the secondary school system, to re-educate and up-skill them in knowledge and attitudes to deliver the new competencies, and in the management of careers and development.

Industry

The Australian manufacturing sector has been in decline for many years, and then all but decimated by global economic forces. The furniture industry has shared that significant downturn. The loss of employment opportunities is reducing our infrastructure and skills base to such a degree that this sector of manufacturing could go totally offshore, as has clothing and footwear.

Furniture manufacturers could all benefit from taking the ideas in this report on board for future directions and planning.

Professional Associations

The FIAA (Vic/Tas) are the employer association that represents the manufacture of domestic furniture in Victoria. They, and their state counterparts, can share the information in this report with their members and advise them in the up-skilling of the employees, to improve processes and product, and help move towards sustainable furniture manufacturing.

The Furnishing Teacher's Advisory Group (FurnTAG) a number of whose members have undertaken ISSI Institute Fellowships, will be able to use this information to disseminate the findings and outcomes of this report to a broader audience of all Australian colleges who deliver furnishing programs. The recommendations of this report suit all aspects of the furnishing industry, not just upholstery.

FURNITAC (Furnishing Industry Training Advisory Committee) is the Victorian government funded training advisory committee, which is a vehicle that feeds training needs and opportunities to the industry and to the government. They also assist in the development of projects for training products. This report contains information and suggestions that could guide their future directions.

The Australian Made Campaign encourages the purchase and sale of Australian made products. For example, the partnership with Bev Marks chain of retail outlets selling bedroom and upholstered furniture has been a great success. Holmesglen TAFE recently entered a partnership with these two with product design and prototyping, and the finished product is now in production and on the shop floors. This partnership can help promote the ideas and changes recommended in this report.

Educational Institutions

Upholstery apprenticeship numbers in Victoria have dropped from over 200 in 1997 to just 22 for the whole state in 2009. The Fellow teaches 19 of these apprentices. This has impacted education and training, as funding levels have dropped and it is hard to compete for education

Acknowledgements

dollars when the sector represents such a small slice of the industry. Many apprentices are laid off before finishing their trades because of a lack of work, and end up unemployed.

Skills Victoria is responsible for funding of training to new apprentices and existing workers. It is recommended that Recognition of Prior Learning should be used to address identified areas of skills deficiency.

All colleges delivering furnishing training, including secondary colleges delivering Design and Technology subjects and Interior Decoration and Design deliverers are working with AQTF levels I to level XI in the furnishing training package. This report will be made known to them and will help influence the sustainability direction of education.

About the Fellow

Name: Jennifer Critchlow

Employment

- Teacher, Upholstery, Furnishing Industry Design and Innovation Centre, Holmesglen Institute of TAFE

Qualifications

- Certificate III in Upholstery, Kangan Batman Institute, 1998
- Certificate III in Motor Trimming, Kangan Batman Institute, 1999
- Diploma of Arts – Furniture Design, Royal Melbourne Institute of Technology (RMIT), 2001
- Certificate IV in Training and Assessment, Northern Melbourne Institute of Technology (NMIT), 2002
- Diploma of Training and Assessment Systems, Northern Melbourne Institute of Technology (NMIT), 2003
- Bachelor of Adult Learning, Monash University, 2006

Memberships

- Secretary, Furnishing Teachers' Advisory Group

The Fellow is widely travelled, both in Australia and overseas, and spent the first half of her working life gaining a wide variety of work experiences, doing whatever job became available in whatever place she found herself. This included secretary, off-set printer, deck hand on a prawn trawler, storeman in mining towns, nanny, machinist, taxi driver, truck driver, asking questions and picking up skills wherever she went.

In 1987 in order to fund the establishment of a vineyard, the Fellow started a small upholstery workshop, using skills in mechanics, sewing machining and upholstering she had picked up in her travels. It was with this activity that she built up her skill base, learning from every piece she pulled apart. Having been the family dressmaker from childhood, and later a wardrobe assistant in the newly formed Nimrod Theatre in Sydney, she learned that it was much easier to 'dress' static furniture objects than flexible humans. Her product base expanded to include marine products, truck and bus applications, motor vehicle interiors and soft- and hard-tops, marine rescue equipment, specialised vehicle manufacture (hearses and stretch limousines), as well as domestic upholstery.

In 1997 the Fellow moved to Melbourne, re-entered formal education and decided to become a teacher.

The Fellow is sorely tired of seeing upholstered furniture on suburban roadsides, and eagerly awaits legislation to prevent non-recyclable poor quality products being manufactured and sold in this country. By simplifying the components of upholstered furniture to steel and single-grade quality foam, and developing removable covers that can be laundered, replaced or removed at end of life (EOL), we can revolutionise our soft furnishing industry and ensure it is in line with current European trends.

Aims of the Fellowship Program

In order to investigate, understand and analyse the identified skills deficiencies in Australia, the following areas of study were analysed:

Framing

- Document the range of materials used for framing, such as steel, aluminium, alloys, and polycarbonate.
- Understanding the techniques used for forming the frames.
- Collecting information on suspension systems that can be used within the frames.

Materials

- Identifying new tanning methods that make leather more amenable to the new techniques—the variability of stretch in leather has always been a problem.
- Identifying quality control processes used for leather, such as electronic hand-held devices to scan thickness of hides to uncover hidden flaws.
- Identifying the latest patternmaking materials and determining the best-practice sheet material.
- Identifying the materials used for visible parts of the frame, such as legs and castors, arms.
- Identifying new sustainable fabrics with better qualities for longevity, including durability, colour fastness, 'launderability', and UV protection.

Construction and Assembly

- Finding sources of new adhesives that enable concave surface upholstery.
- Learning new techniques in machining fabrics and leather.
- Learning techniques to enable complex fabric/leather covers to be manufactured in one piece.
- Compiling a file of techniques for attachment, including internal and external methods, identified manufacturers, methods, costs and applications.
- Researching and understanding various finishing techniques, including zippers, Velcro, removable plastic plugs and studs.
- Distinguishing between alternative methods of cutting and stitching, and the use of microfibers.

Equipment

- Identifying and analysing specialised sewing machines that allow more accurate top-stitching.
- Discovering new/updated pattern-making equipment.
- Understanding new technology for joining seams, such as automated, fusion, and adhesion.
- Differentiating between alternative spraying equipment, for example the differences between environmentally friendly and user-friendly.

Aims of the Fellowship Program

Sustainability

- Identifying materials sourced on their recyclability/sustainability capability, including templates, foams, and fabrics.
- Determining techniques of attachment of furniture covers that enable the easiest removal.
- Identifying whether the covers can be removed/replaced in the client's premises.
- Discovering current practices of laundering/dry-cleaning covers. Identifying new methods that are more environmentally friendly.

Recycling

- Determining the methods/technologies that are currently in use for separating the frame/foam at EOL.
- Determining where the components go at EOL.

The Australian Context

There seems to be conflicting dialogue within Australian industry as to a single acceptable common meaning of 'sustainability'. For some, it is anything that will assure the future of their manufacturing, such as new and cheaper sources of raw materials, power, technology or labour. For others it is more to do with the future of our biosphere, where we all live and work. The Fellow acknowledges both meanings, but it must be noted that the ISS Institute adopts the United Nations definition as highlighted in the definitions section at the beginning of this report.

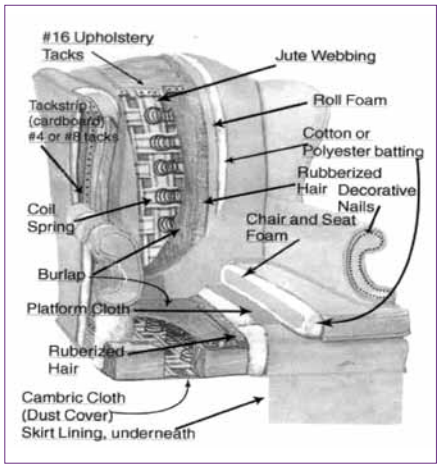
To manufacture a product which continues to degrade our biosphere seems to run contrary to the aims of the United Nations Decade of Education for Sustainable Development, which states that:

"The goal of the United Nations Decade of Education for Sustainable Development (2005–2014, DESD), for which UNESCO is the lead agency, is to integrate the principles, values, and practices of sustainable development into all aspects of education and learning.

This educational effort will encourage changes in behaviour that will create a more sustainable future in terms of environmental integrity, economic viability, and a just society for present and future generations".

The purpose of this Fellowship was to help bring back skills, knowledge and attitudes from selected countries in the Northern Hemisphere. Many regard the Northern Hemisphere, particularly Europe, as years ahead of Australia in terms of social pressures, experience of war, limited natural resources and commodities, pollution from poor manufacturing practices, and proximity to third world countries. The Fellow chose to visit this area because she believed that these factors have had a significant influence on their furniture manufacture and restoration activities.

Upholstery in Australia



Most of the upholstered furniture currently being manufactured in Australia is constructed in a time-consuming, labour-intensive way using a multitude of components. Most frames consist of several types of timber, from manufactured board to hardwood. Construction methods include glue, screws, and nails, with timber blocks in the corners to strengthen the structure. Then layers of flexible support material are used, including elastic, jute and nylon/polyester webbing, cardboard, plastic, steel zigzag springs, coil springs, as well as hard edge treatments from polystyrene through plastic and cotton, waste paper and other natural fibres.

The diagram above highlights the complexity of existing construction components.

Several different grades and thicknesses of polyurethane foam are then cut from sheets of material two meters square and stapled on the frame to create comfort and contour. Pieces of fabric are then stapled directly to the frame, each new edge covering the last, until all the fabric is stapled underneath. Feet are then fitted, ranging from timber to plastic and metals.

The Australian Context

The complexity of construction and difficulty in separating individual components makes this style of furniture impossible to recycle. EOL is when the fabric wears or becomes dirty, and the whole piece is then sent to landfill. It is more expensive to remove the cover to re-upholster it than it is to start from new. It is not cost effective to replace the cover because of the labour involved.

None of the leading manufacturers of domestic lounge furniture are currently producing recyclable furniture. After speaking to leading Australian manufacturers of commercial and domestic furniture, including Schiavello, View Furniture, UCI and Burgtec, it is obvious that this area of injection moulded steel/polycarbonate framed furniture is being investigated by many local companies in an effort to stay competitive. Some are importing the frames; others are making pull-on covers and putting them over traditionally made timber frames. No one is actually managing all areas yet, as the traditional injection moulded tooling is too expensive.

One company is looking into getting the tooling for one popular line of tub chair that they produce in Western Australia.

There are plenty of companies able to produce the steel/polycarbonate frames that form the skeleton beneath the foam, but the cost of setting up a mould to form shapes by injection moulding foam seems prohibitive. The pull-on covers are being manufactured in a limited fashion for smaller items like ottomans and some tub chairs.

Steel frame injection moulded foam foundation universally used for motor vehicle seating

The Fellow has been a manufacturer and restorer of both motor vehicle interiors and domestic and commercial furniture for over 25 years. During that time, the difference in technology and sophistication between the motor vehicle seating and domestic/ commercial manufacture and upholstery has considerably widened.

Very little has changed, in general, regarding the upholstery methods in Australia since the introduction of man-made materials during the latter half of the 20th century. Polyurethane foam replaced latex, coconut fibre and other natural products, and elastic webbing and zigzag springs have largely replaced coil springs.

A plethora of materials and extrusions have made furniture more lightweight and quicker to construct, but the basic construction methods have changed little.

A two-year furniture design diploma in 2000/2001 broadened the Fellow's view and educated her to consider the classic designs and new movements in European furniture, which appeared to be using motor vehicle technology approaches. Since becoming an upholstery teacher in 2003, and visiting many companies employing apprentices, the skill deficiencies in cutting and sewing became all the more obvious and alarming to the Fellow. The global economic pressures closed down manufacturer after manufacturer as they were unable to compete in the world market due to the lack of skills development using modern sustainable techniques and materials.

Every year there is more and more furniture on roadsides, put out for collection, that ends up as landfill. In this decade of sustainability where the demand is to stop wasting natural resources and to reduce pollution, this is inexcusable and the trend must be halted.

By introducing new and updated skills to the local industry that will enable them to produce better quality, longer lived furniture, we will not only help them be more competitive on the global market, but will also be reducing the energy used to manufacture 'disposable' furniture.

Herman Miller, one of the most successful international furniture makers, gives a 12-year guarantee on all the furniture they produce, including cover, components, fittings and frame.

Positive Vision

Natural Capitalism: Creating the Next Industrial Revolution is the first book to explore the lucrative opportunities for businesses in an era of approaching environmental limits, and has been embraced by many multinationals, including the Xerox and Shell organisations.

"For decades, environmentalists have been warning that human economic activity is exceeding the planet's limits. Of course we keep pushing those limits back with clever new technologies; yet living systems are undeniably in decline. These trends need not be in conflict-in fact, there are fortunes to be made in reconciling them". (Reference: http://www.natcap.org/sitepages/pid5.php)

The first of Natural Capitalism's four interlinked principles is:

- Radically increased resource productivity.

  Implementing just this first principle can significantly improve a firm's bottom line, and can also help finance the other three. They are:

  – Re-designing industry on biological models with closed loops and zero waste.

  – Shifting from the sale of goods (for example, light bulbs) to the provision of services (illumination).

  – Re-investing in the natural capital that is the basis of future prosperity.

SWOT Analysis

A SWOT analysis identifies the various factors relevant to a specific activity, under the headings of strengths, weaknesses, opportunities, and threats.

Strengths

- The upholstery sector has undergone critical decline due to the enormous impact of cheaper imported furniture, in particular from the burgeoning Chinese manufacturing industry. Those firms left operating are the best of the best—passionate, willing to change and move with the times, try out new ideas, and adopt new technologies. They are also willing to look at new ways of promoting the industry, for example, Australian Made, Australian Grown (AMAG) Campaign.
- Manufacturing techniques are more technologically advanced, and have been changed and pared down so that these companies are much more efficient than ever before.
- Because of the enormity of the global threat, there is a new atmosphere of cooperation amongst these companies as together they face this larger global threat. They no longer compete as strongly against each other, but each is trying to stand alongside imported furniture.

- We enjoy close proximity to Australian suppliers who guarantee the quality of their fabrics and leathers and who are well established with worldwide reputations.
- Australia has an international reputation for excellence in delivering training, and has passionate and enthusiastic teachers and students who are unwilling to let the industry and traditional skills disappear.

Weaknesses

- Economies of scale—because of the relatively small size of the local consumer population, it is not possible to take full advantage of economies of scale.
- Skill deficiencies—our smaller population and the decline of the manufacturing sector means we do not currently have a skilled workforce to produce upholstery the 'new' way, which focuses much more on cut and sew than it does on upholstery.
- Promotion of industry is almost non-existent, except for the Australian Made, Australian Grown (AMAG) Campaign.
- There has been greater difficulty in recent years attracting new entrants into the industry. Upholstery is not seen as an appealing option for young men and they can make more money in other trades that are considered more 'manly'. Very few young women are choosing it as a trade.

Opportunities for Growth

- Demands for variety—local customers want more designs that are particularly Australian, especially outdoor fabrics, to cope with the Australian climate (extension of the living room into the outdoors).
- Apartment-style living is on the rise in Australia—new styles and fabrics are needed for open-plan living/loft areas.
- Resurgence of interest in heritage skills, preserving history, and restoration of antiques could lead to a developing opportunity for this type of furniture.
- As the principles of sustainability become more strongly embedded in our culture, it will become less acceptable to buy 'disposable' furniture. This should lead to the resurgence in the recovery sector of the upholstery industry.
- Our local market is closer to us than it is to the imported sources, and if we can produce the right quality product, consumers are more likely to buy Australian made where service and warranty can be assured.
- There is no significant reason we cannot compete on the world market. Australian owned and based companies can use global production facilities in a similar manner to other major international companies and be just as competitive.

Threats

- The current global recession makes it difficult for small domestic manufacturers here in Australia to create new markets and adopt new technologies due to economic uncertainty. To invest in infrastructure at such a time would be daunting, and, in fact, may be beyond a number of small manufacturers.
- Steady improvements in the quality of products coming from China often attract the fickle Australian consumer for whom the bottom line often is price over patriotism and the environment.

Identifying the Skills Deficiencies

Identify drivers that will push our industry in the near future.

Investigate legislation, social change, consumer opinion and the expense of recycling. Interview a selection of those organisations involved in sustainable furniture design, manufacture and sales and ask, *"Why are you doing this?"*

Aim: To become skilled in understanding the need to adopt sustainable upholstery industry practices. Gain the skills to be able to convince local industry of the need to open their minds to sustainability, not as a philosophical concept, but as an economic imperative and social benefit.

Identify companies that are operating on 'take-back' principles.

Conduct interviews with managers of recycling departments to find out the benefits and difficulties involved in 'take-back' principles. Record the methods of separating components, percentage of recyclable components, percentage of re-usable components, and document end-use for all components and the range of options for EOL.

Aim: To determine and record world's best current practices in producing and re-manufacturing or recycling sustainable furniture.

Research and document samples of fitting and fixing equipment and hardware.

Document all finishing techniques such as zippers, Velcro, plugs, studs, hooks, elastics, and internal attachment methods, components and techniques. Explore manufacturing methods and techniques to enable the end user to remove and replace covers, rather than returning to workshop. Research the use of non-toxic fabric shielding to extend the life of fabrics.

Aim: To compile a database of accessories/attachments/adjuncts of the new methods of construction which may be used to extend the life of upholstered furniture.

Observe methods of construction of removable covers

Investigate and analyse joining methods such as sewing machines, heat bonding equipment, post production shaping techniques. Collect information on machines and attachments that allow for a consistent finish, such as top-stitching and other decorative finishing techniques; new technology for joining seams such as automated, fusion, adhesion, for machining leather; and other new manufactured fabrics, such as macro suede and coated fabrics. Document the order of assembly for complex covers.

Aim: To understand and then become skilled in recommending construction methods for different styles of covers and fabrics.

Investigate sustainable fabric sources such as fabrics from recycled materials or small carbon footprint materials, and differentiate factors that make some fabrics more suitable for removable covers

Conduct interviews and discuss factors such as flexibility, durability, 'launderability', UV stability and colourfastness. Identify treatments or other factors that make leather hides more amenable to well-fitted removable covers cut from templates. Document new materials for template making. Identify affordable equipment for thoroughly checking quality of leather hides to avoid irretrievable errors. Record the methods of cutting and stitching microfibers.

Aim: To understand and then become skilled in recommending appropriate fabrics for sustainable furniture, and compile a database of sources of material and equipment.

Collect, record and analyse data on the use of adhesives in sustainable manufacture of upholstered furniture.

Adhesive types that are non-toxic during production use EOL adhesives for different bonding applications and setting times, such as catalyst-activated adhesives, light-activated adhesives made for the upholstered furniture market. Spray adhesive equipment—methods of application non-invasive colourless adhesives for attaching fabrics to concave curves.

Aim: To become skilled in the identification of appropriate adhesive for different upholstery applications, and be able to recommend from the range determined by cost versus sustainability factors.

Visit appropriate places of learning to identify how they are introducing principles of furniture sustainability into their curricula.

Interview teachers, professors and other members of selected learning institutions and gather materials they are willing to provide regarding sustainable furniture manufacturing.

Aim: To gain current overseas skills and knowledge in training and to assess the application of sustainability practices in the Australian upholstery industry. To apply this knowledge to the development of the National Centre for Sustainability's units of competency in Sustainability and the Learner's Guide for Certificate III in Upholstery (Apprenticeship Course).

Why the Skills Deficiencies Need to be Addressed

The Australian furnishing industry has been in steady decline for many years and this is reflected in the amount of training being undertaken nationally. In Victoria there are only around 20–25 apprentices employed as upholsterers, but no students enrolled in Soft Furnishing, Upholstery is on the CRICOS list.

Upholstery is also one of the qualifications that attracts funding through the Australian Government's Enterprise Based Productivity Places Program (EBPPP) This enables an employer to receive funding for up to 90% of the qualification for existing and mature aged workers.

The sector needs to use every method available to maintain a presence in Australian Manufacturing. The skill deficiencies identified can help local manufacturers enter a market area that is currently serviced mainly by overseas manufacturers.

Extended Producer Responsibility (EPR)

Since the Organisation for Economic Co-operation and Development (OECD) began its work on EPR in 1994, almost every member country has implemented one or more EPR programmes. These programmes vary considerably due to a number of factors, such as the difference in the products or waste streams covered, instruments (instrument mixes) used, and how the responsibility is shared among the players in the product chain. However, it seems evident that EPR will continue being part of product and waste policies in OECD countries. Australia has been a member of the OECD since 1971. Australian Federal policy on EPR is patchy, but the state policies of NSW, SA and WA have EPR clearly defined.

Identifying the Skills Deficiencies

A Handbook of Industrial Ecology by Robert U Ayres, and Leslie W Ayres (2002) states:

"The OECD has provided a definition of extended producer responsibility:

EPR is defined, for the purposes of the OECD project, as the extension of the responsibilities of producers to the post-consumer stage of products' life cycles. EPR strategies suggest that the use and post-consumer phases of a product's life cycle are important aspects of the 'pollution' for which responsibility must be assumed under the Polluter Pays Principle (OECD 1996b, pp15-16)...

New Business Development Resulting from EPR in the Furniture Industry

Two noteworthy US furniture companies selling their office furniture products around the world are Herman Miller Inc and Steelcase Inc. Both companies and have developed comprehensive environmental programs aimed at eliminating or minimising life cycle environmental impacts, particularly those resulting in solid and hazardous wastes... Design for disassembly principles have been embodied in their furniture to help ensure that service and repair, end-of-life remanufacture and materials recycling are not only realised but add value to the overall enterprise...

Herman Miller not only takes back and remanufactures its furniture products; it has also established a subsidiary company, called Phoenix Design, to operate that business...

A German furniture manufacturer, Wilkhahn, is also pushing the boundaries by developing ergonomic chairs with durability and recyclability in mind.... Although the complete range of Wilkhahn furniture aims to address environmental factors, its highest profile 'green' product is the Picto chair.... As a primary objective, the Picto is 'built for longevity' with materials specified that help increase product durability and overall product life. Service and repair also plays a key role in helping keep Wilkhahn chairs out of the waste stream. Finally, when the chair is beyond repair or no longer required by the first customer, Wilkhahn will 'take back' the chair and either refurbish, re-use components, or recycle materials."

EPR is becoming a byword amongst big business worldwide as companies like DuPont, Xerox, and Kodak implement voluntary measures to take back products at EOL and factor that cost into their production decisions. If a piece of furniture has to be taken back at EOL, it is in the manufacturer's best interests to make sure that it is a long and usable life, and that the furniture can be re-manufactured when one consumer has finished with it.

The International Experience

All destinations were site visits or interviews with managers.

Visit 1: Herman Miller Inc (HM), Michigan, USA

Contacts: Bill Lausch, Senior Materials Application and Design Manager, Production Factory; Kris Spaulding, Environmental Project Manager, Environmental Section, and Linda Milanowski, Director of Materials Research

Herman Miller Inc (HM) is a major furniture manufacturer, specialising in commercial office furniture. They achieved listing on the 2009 Sustainable Business 20 List, which lauds the World's top sustainable organisation's stock (share) value.

Although HM have a long history of being environmentally aware, their current status has been encouraged and formalised because in 1998 the U.S. Green Building Council (USGBC) developed a certification system for buildings This includes the furniture in the buildings. Although this is voluntary, it is being widely taken up by most major multinationals and government departments in the USA on all new building projects, and many other countries have developed their own rating system.

HM report that when they receive request for quotes on furniture supply, 90% of customers ask questions regarding the Leadership in Energy and Environmental Design (LEED) certification for environmental compliancy. This is driven by the green building movement and customer demand. California has very progressive environmental legislation; it forms a large part of the American market and therefore leads design in this area. One of the LEED criteria covers material chemistry and evaluation for products. They review specifications on any new material developed for use.

The Sustainable Furnishings Council (SFC) is a not-for-profit balanced coalition of industry players. This was founded at High Point, North Carolina (home of American Furnishing Industry) in October 2006 to promote sustainable practices among manufacturers, retailers, and consumers alike. The SFC defines 'sustainable practices' as *"...efforts by industry to achieve sustainable development goals that call for simultaneous performance improvements in economic vitality; ecological integrity; and social equity."* The SFC recognises the overwhelming scientific consensus that our world is experiencing extreme global climate change. SFC members acknowledge the tremendous urgency, and take immediate steps to minimise carbon emissions, waste stream pollutants, un-recyclable content and primary materials from unsustainable sources from any product platform under their control.

The SFC uses a tool called Life Cycle Assessment (LCA) that identifies twelve environmental benefits/impacts of products for the product stages of extraction, transportation, use, and final disposition or re-use. These twelve impacts are:

- Global Warming
- Acidification
- Ozone Depletion
- Eutrophication (excessive nutrients in water)
- Photochemical Smog
- Human Health
- Ecological Toxicity

The International Experience

- Fossil Fuel Depletion
- Habitat Alteration
- Criteria Air Pollutants
- Water Intake
- Solid and Hazardous Waste.

Also required to be identified are Pollutant Flows (Flue Gas and Wastewater), Recovered Matter, Other Air Emissions, and Other Water Effluents.

The US Environment Protection Authority's 'Design for Environment' (DfE) program steers suppliers to use more environmentally friendly processes, and has reached more than 200,000 business facilities and approximately two million workers. In 2008, DfE reduced the use of chemicals of concern by approximately 330 million pounds.

Business and Institutional Furniture Manufacturer's Association (BIFMA) has also created voluntary standards:

"We develop voluntary product and industry standards that support safe, healthy and sustainable environments; publish key industry statistics; advocate for legislation and government regulation that have a direct impact on the health of the industry; and facilitate meaningful dialog and education to support our core services and the industry we serve".

Most major customers demand recycling—80% of furniture is donated to charities within 100miles. Waste brokerages sell to them to enable continued re-use. The size of the USA makes it difficult to collect all unwanted furniture. Most is re-purposed by non-profit groups. If a customer is emptying out a facility and signs up to a re-purpose program, all equipment is sent to charitable groups. There is a small economic benefit from recycling waste.

HM originally operated its own 'take-back' company, called Phoenix Designs as a separate organisation. Separating components is one of the principles of design for environment protocol. All products must be taken apart using common tools in reasonable time. All materials are labelled for recycling. HM is now an industry leader in EPR. HM also run a program for prisons that started off with inmates making low grade office furniture. The Director of HM said that instead of making furniture they now disassembled recycled products and sent usable components to recycling streams.

HM offer a 12-year warranty, which includes service on any part—they come to you and replace the faulty part. Their textiles use nanotechnology to enhance longevity, and for medical and antibacterial applications. Leather technology has advanced and they now use only chrome-free leather. The vegetable tanning method takes longer, but produce a more environmentally friendly product.

The latest new fabrics are being developed from recycled products:

- Polyethylene Terephthalate (PET) accounts for 20% of bottles recycled, such as soft drink (soda) bottles and water bottles. Soft drink companies need to be more sustainable. Coca Cola in the USA has a campaign to recycle bottles by offering a ten-cent return on PET bottles that can then be recycled as synthetic fabric.
- 'Kira' is a new fabric that is corn based. Although it uses food grade corn, it meets all HM sustainability standards. Although it may be environmentally acceptable, it creates other issues, such as ascertaining where the corn is coming from.

- Dyes often use the toxic chemicals necessary to get vibrant colours. Halogenated colours require chemicals such as chlorine and bromine, which are carcinogenic. Natural colours are more eco-friendly to achieve, so the consumer needs to be educated.

HM are investigating the use of stinging nettle and wool and nettle mixes as a base for a fire resistant fabric. Natural fibres, such as wool are less damaging to the environment and therefore more acceptable to the market. They are also working towards developing the molecular structure of the adhesive to match the fabric and the plastic base, so that all can be recycled together.

All finishes and adhesives are now water based. HM have a goal: that by the year 2020 they will have zero waste, be using 100% green energy, zero air emissions, zero waste-water discharges, zero hazardous waste, and zero landfill. This program started in 2004. They have been collecting information, and are 80% of the way there. Their website (www.hermanmiller.com/About-Us/What-We-Believe), clearly identifies their goals. One of their current challenges is to match the water-based finishes with the substrate.

HM train all new employees during their induction process regarding the company's environmental attitudes, corporate goals and in-house product development. During these induction sessions the CEO, Brian Walker, talks with passion about the company's goals. They educate employees on how to be better environmental stewards in general life, not just at work. They give seminars on carbon footprints, green cleaning, a newsletter twice a week, and regular emails. When fuel prices were high, carpooling was instigated, and is still going on. This was publicised on an internal website and HM encouraged it by offering incentives. They saved 160,000 miles in six months.

HM does some leasing of furniture to companies that meet their criteria, but this is not common yet. Furniture is designed to be easy to fix.

Visit 2: Context Furniture, Detroit, USA

Contact: Kerry Mole, Design Director

Context Furniture is a small designer/manufacturer that specialises in custom mass production of mostly sheet material furniture using Just-in-Time (JIT) techniques. They are web based and do not have a showroom or carry stock volumes. They produce to order using proven techniques. They use environmentally sustainable manufactured board materials.

Visit 3: College for Creative Studies, Detroit, USA

Contacts: Imre Molnar, CEO; Maxwell Davis, Professor of Furniture Design, and Holly Tylenda, Colours and Materials Librarian

According to Maxwell Davis, IKEA have changed the furniture taste of the average American homeowner. The public have become used to having good-looking, affordable pieces in their homes, and they want to replace them with good design but better quality products.

Legislation has just been passed in San Francisco that all post-use consumer goods have to be recycled, composted or re-used, but California is very progressive in this area. There are no Federal laws on recycling or sustainability yet. For example, Michigan is very low on the sustainability ladder because of poor political will and poor per capita income.

Visit 4: London Metropolitan University

Contact: Malcolm Hopkins, Fellow of the Association of Master Upholsterers, Senior Lecturer in Upholstery

Malcolm Hopkins promotes the use of all natural, landfill-friendly, pre-industrial revolution materials. The UK holds in esteem bespoke furniture of excellent quality and of heirloom standard. However, this may not be affordable for the majority of consumers.

The Furniture and Fire Regulations Act of Parliament 1988, covers domestic and commercial furniture. Non-natural materials are particularly fire prone. Natural materials are generally non-toxic. Re-covering of lounge suites must be done to 1988 fire standards. To comply with fire retardant laws, fabrics have to be 75% natural fibre. If fabric doesn't meet regulations, barrier cloth must be used. Special fibres are inserted to increase fire retardancy. Councils will no longer pick up used lounges—the consumer has to pay for recycling or destruction.

Visit 5: Lynplan Pty Ltd, Croydon, United Kingdom

Contact: Andrew Vipond, Managing Director

Lynplan are based in the UK and are manufacturers of tailored, removable furniture covers. In this establishment, three people develop patterns. These are then passed on to two Lectra plotters who convert them for Computer Numerically Controlled (CNC) cutting and save every pattern they plot. Many of the bespoke lines have a name and model number that enables templates to be re-used; very few patterns are one-off.

Fire legislation had a huge impact on the way furniture has been made since 1988. This was the biggest driver for loose cover suites because to re-upholster them in accordance with the Fire Regulations Act meant that all the foundation materials had to be replaced with fire retardant foam etc, not just the surface fabric. Loose covers obviated the need to touch the original piece, yet still allowed a new cover.

Economic Drivers

Economic demands are moving toward a fashion of 'shabby-chic' loose covers. Replacement loose covers do sell, but new furniture is about 30% removable covers, 40% leather, and the rest standard upholstered cover. In many cases, frames are made in the UK but the covers are cut and sewn abroad because of cheaper skilled labour. Loose covers are quite complex to construct.

Consumer opinion will drive industry codes of practice. Better quality and individuality are the latest drivers from consumers. Recycling, due to consumer demand, is just beginning to have an impact and this may be responsible for increasing the emphasis for this type of recycling and other EOL options.

Recycling of manufacturing materials is also increasing; such as fire retardant foam off-cuts going back to the manufacturer to be made into rebond foam. All non-fire-retardant foam goes back to make carpet underlay.

Lynplan has 80 employees, 35 are employed cutting and sewing loose covers. Of new furniture being sold, 30% had loose covers. Shabby-chic started the fashion, and people discovered the convenience of being able to wash their furnishing covers, but the loose wrinkled look is now down to 10% of the market, and fitted, tailored loose covers are more in demand. IKEA avoids the fire retardant law by having loose covers, also resulting in space savings and freight savings. These can be delivered instantly from stock in a wide range of fabric choices satisfying the current demand issue of speed of delivery.

Fabrics

100% cotton covers are 100% organic and recyclable. UK Legislation requires that replacement loose covers must be fire retardant. With a tightly tailored cover you can't have any shrinkage, and as all synthetics are machine washable Lynplan works with the fabric mill and specifies pre-shrunk fabrics.

Adhesives

Adhesives are now generally water based and non-toxic, Acroft adhesives don't need special protective equipment for the user. Lynplan spent a lot of time and effort finding the right adhesives to satisfy not only the developing legislation and environmental aspects but also the consumer demand for quality. All adhesives they use have a range of curing times.

Visit 6: Furniture Industry Research Association (FIRA), Stevenage, United Kingdom

Contact: Mark Bronka, Operations Manager, Testing Services

FIRA have introduced free software for calculating carbon footprints. All furniture retailed in the UK has to pass the fire retardant test, and they also test 'fit for function' with a multitude of custom built machines, as well as the standard fabric tests for functions such as rub and stretch.

The public are more aware of environmental issues. Retailers have to test all imported furniture to meet standards. Trading standards investigate complaints and advise on whether the quality is fit for function. Courts are expecting retailers to do the right thing.

Cost of Recycling

It is becoming more difficult to dispose of EOL products in landfill. Recycling centres demand that different products are separated, and social pressure is increasing. Landfill is becoming more expensive.

Visit 7: Wendy Shorter Interiors, Colney Heath, United Kingdom

Contact: Wendy Shorter, CEO of Wendy Shorter Interiors, and Director of Training, Association of Master Upholsterers & Soft Furnishers

Fabrics

Fabrics used for furniture manufacture must now be blended because of fire regulations. Non-retardant fabrics need at least 75% natural fibres, such as cotton, silk, wool, linen, modal (viscose) both from timber extrusion. Fire retardant treatment is a toxic brew and most synthetics melt with heat. The UK is going back to natural fibres and traditional materials that will rot or rust if used as landfill, and away from synthetic foams and fabrics.

Wendy Shorter, CEO, Wendy Shorter Interiors

Herman Miller offices, Milan

Visit 8: Herman Miller Ltd, East Mediterranean Region, Milan, Italy

Contact: Michele Falcone, Managing Director

Sustainability

Michele Falcone spoke of the difficulties of exporting in a global market where each country has different rules regarding sustainability, safety and recycling options. HM identifies the country with the most stringent standards and makes all its furniture to that standard, so that there are no problems with international trade.

Streetscape, Milan

Visit 9: Poltrona Frau, BeB Italia, Cassini, Balearo etc, Milan

Removable and Re-usable

The Fellow visited a number of up-market furniture shops in Milan and was greeted in a friendly fashion and allowed to inspect the furniture. Tailored, removable covers were ubiquitous. The quality was impeccable. Fibres were mostly natural or a mix of natural and synthetic to improve durability or handling. Design quality was obviously paramount.

Grand Papillo is covered in pure wool with a rear zipper

Visit 10: Antidiva Furniture, Community of Lentate sul Seveso, Milan, Italy

Contact: Alessio Canovese

The US market buys Eco label. Customers in multinationals often request recyclable products. The Northern autonomous regions of Italy are very green oriented, especially near Switzerland and Austria, and these ideas have spread over Italy. For example, in Milan a skyscraper was completely dismantled and rebuilt using principles of sustainability. New houses have environmental ratings (including furniture), which the government rewards with a tax benefit, and these properties demand a higher resale value. Federlegno (the Italian Federation of wood, cork, furniture, and furnishing manufacture) is the national body that links the main companies in furniture together, and ensures all new standards are followed.

Antidiva's Tukama

Adhesives

All adhesives must be water based when constructing foam under Italian laws which vary with regional standards. Inspectors arrive every year to take blood tests from the employees using adhesives in order to test for toxins. Every year all employees have a medical test to monitor their long-term health. Great skill is needed when gluing fabric. There is a low margin for error. Very few fabrics can be glued to concave curves. The stronger, fast acting, solvent-based, contact adhesives are still the most reliable product.

Furniture making is traditionally a dirty business: many of the raw materials such as foam, aluminium, and chrome are quite bad for the environment. Polished aluminium is totally recyclable. Powder coating uses no toxic solvents, unlike traditional coating methods, so is less harmful to the environment.

Fabrics

Fashion currently dictates natural cloth. 100% wool is the most popular choice. House owners can remove and replace our covers. Tuscany is specialising in vegetable dying for leather covers. Elmo, a Swedish company has developed a chrome-free leather. Chrome tanning is very toxic. However, so far there is only a limited range of colours possible when using natural tanning methods. Leather cutting is still labour intensive as each hide must be tested by the cutter, and he/she decides which template to use for the required variability in stretch.

Education for Sustainability

There is not much opportunity in Italy for a formal apprenticeship in this aspect of the furniture trade. Some colleges teach fabric technology and use, but not specifically for furniture, rather it is more aimed at such areas dressmaking. Therefore sustainability always appears to be taught as a general topic.

Visit 11: Living Divani, Como, Lombardy, Italy

Contact: Francesca Citterio, Export Department

Legislation

Export quality furniture must be fireproof, but the domestic market only requires fireproof rating for commercial applications. IKEA has introduced Italians to good, affordable design. Consumers can remove and replace all the fabric covers, and wash them or get them professionally cleaned. The leather is normally not removable, but they are starting to design leather covers suitable for removal.

Living Divani use all natural fibres with a ten-year guarantee on replaceable covers. There were no stands at the Milan furniture fair advertising eco fabric.

Bubble Rock

Adhesives

Living Divani do not use adhesives on the premises: all frames and cushions are made by subcontractors.

Visit 12: Dema, Certaldo, Tuscany, Italy

Contact: Lorenzo Rubechini, General Manager

Dema use all female upholsterers. Their furniture is export quality, and they use styrene pipes for holding loose covers in position. Consumers can take the covers off and wash them. Poly Vinyl Chloride (PVC) coated fabric is banned in Italy because of health issues.

Plaza chair in fabric by Dema

The above photo shows the Plaza chair, in fabric with steel frame construction, removable cover, padded in different densities of polyurethane foam and covered with a double layer of protective fabric. The back cushion is comprised of foam and certified goose down.

Fabrics

Fabrics used are mostly cotton, wool and linen. Blends of these materials are commonly used.

Visit 13: Segis SpA, Poggibonsi, Tuscany, Italy

Contact: Franco Dominici, Owner, General Manager

Philosophically, Segis is an unusual factory compared to other Italian factories. They are accredited with International Standard 1402 (Environmental Management Systems) certification.

However, Dominici is aware that meeting the letter of the standard does not necessarily give you the best practice. He stated:

"We have to update our mentality according to the needs of the world. The way we sell, communicate, who we are making them for, what waste to reach our destination, just to make our product communicate luxury, waste and pollution do not justify this".

Segis – Highway E

Frames

90% of the Segis SpA products use cold-cured foam over a metal frame. Only the exact amount of material needed is used. It costs more to set up, but this additional cost is outweighed by the savings for the community. Aluminium or steel is used in frames. Elastic webbing cracks with time so zig-zag springs are used.

Fabric

Natural fibres blended with synthetics give a more manageable result. Loose covers produce two problems, it is difficult to get them tight enough so that they do not bag, and they are expensive because of the need for more highly skilled cutters and machinists.

Leather

The speed with which a raw hide is converted has a dramatic effect on the quality of the finished leather. If a hide is left without processing for any length of time, it starts to rot. It takes quite a while for the chemicals to penetrate the hides once they are immersed. To ensure the best quality leather requires the time between the death of the animal and immersion of the hide into the chemical bath to be as close to instantaneous as possible. Vegetable tanning is replacing chrome tanning because of decreased toxicity of the process, and it is a lot quicker these days due to improved understanding of the chemical process.

Adhesives

Adhesive use is now 90% water based glue, with little or no toxic impact.

Industry Code of Practice

According to Dominici:

"About 15 years ago, a group of like minded furniture manufacturers in the Tuscan region met to think about the future of our industry. Sourcing raw materials was discussed, and we refused, like the Germans, to use mahogany timber, which was plentiful but from rainforests, which were endangered, and deforesting kills oxygen for the world. So we looked for different sorts of materials. Nothing exists that is perfect in every direction, but you can find a balance of the right quality and where goods go at the end of life. If you stop using wood to save nature and use plastic and throw it away, plastic invasion toxifies the environment.

Make sure what you replace at the end of life. G10 was in Italy ten days ago, and for the first time China accepted to move towards by 2050 we should reduce 60% pollution. We have to waste less, but it takes time to educate for sustainability. Design is a combination of beauty and practical with least possible consumption from time of production to delivery, and end of life".

Outcomes

The following describes the outcomes of the identified skills deficiencies as highlighted previously in this report.

Identify drivers that will push our industry in the near future.

The aim was to become skilled in understanding the need to adopt sustainable upholstery industry practices. Gain the skills to be able to convince local industry of the need to open their minds to sustainability, not as a philosophical concept, but as an economic imperative and social benefit.

As can be seen in Attachment 1, the industrial/economic era of growth for growth's sake and the single 'bottom line' concept of profit are becoming redundant. There are many frameworks to house the movement towards sustainable development, and each country has its own particular cultural differences, yet there are common threads appearing internationally.

These common threads are:

i) 'triple bottom line reporting' on environmental stewardship, social responsibility, and ethical profit

ii) economic vitality, ecological integrity, and social equity

iii) planet, people, profit

iv) cradle-to-cradle, extended producer responsibility (EPR), and a consumer-led drive towards cleaner greener options.

The drivers identified were:

- Increasing scientific proof of climate change and the effects of pollution on all animal and plant life, including human health and development.
- Resultant consumer reaction and demand for cleaner, greener options at affordable prices.
- Legislative changes wrought by world opinion and leading western nations, who are under greater pressure from larger population densities and concurrent realisation of increasing raw material shortages.
- The economic imperative to reduce waste by charging for recycling from the factory and at EOL, and more realistic costs being placed on things like water and polluting forms of energy.
- Increased awareness of hygiene, IKEA-led design consciousness of the mass markets, and the desire for individuality and change driving the removable cover market for upholstered furniture.

All the countries and companies the Fellow visited were aware of these drivers at some level, but only the successful, high-end furniture manufacturers were designing and producing furniture that minimised waste in the production process. Only these manufacturers produced quality 'long-life' furniture, which universally had removable covers for regular maintenance and used 'clean' raw materials and processes as far as was possible.

Usually these processes had been implemented as a result of gubernatorial mandate at some level, whether it be political reaction to health issues or led by an association level of concern for the future of their industry. Europe particularly, is well ahead of the USA and Australia in paradigms of sustainability, where it is no longer a subject of conversation and has been absorbed into the national psyche.

The USA seemed to be a patchwork quilt of attitudes and laws. Even with one state, local laws governing such things as plumbing requirements for houses varied dramatically. The cult of individualism and the freedoms of the Constitution have led to laissez-faire paradigm which does not readily allow top-down governing on environmental issues. Parochial media leaves the general populace largely ignorant of global issues.

The Australian Government has already set up a National Sustainability website, and seems willing and able to work nationally on this issue.

Identify companies that are operating on 'take-back' principles.

The aim was to determine and record world's best current practices in producing and re-manufacturing or recycling sustainable furniture

Very few companies were aware of the concept, with the major exception being HM. They have experimented with this but found the tyranny of distance and the lack of a national or international capillary network to collect individual pieces from the diverse locations of consumers and bring them home to the manufacturer made the concept unworkable at the present time. Regional sorting and collection facilities in major centres across America were discussed, but the furniture that is sent to international destinations presented more complex issues. Does the cost of transport leave a larger carbon footprint than suitable local recycling? HM have decided to make their furniture 100% recyclable from 100% recycled raw materials, so that any local recycling company can properly deal with the components.

The idea of 'take-back' is being taken up voluntarily by many other industries for whom the practicalities are more manageable. For example the USA has laws to mandate that battery companies take back rear batteries to avoid pollution at landfill, and any shop selling batteries can be used to return them.

Research and document samples of fitting and fixing equipment and hardware.

The aim was to compile a database of accessories/attachments/adjuncts of the new methods of construction which may be used to extend the life of upholstered furniture.

Unfortunately, this was a largely unsuccessful venture. The Fellow managed to find a few different products but these were generally variations or refinements of something available in Australia, such as a much softer, finer version of Velcro and custom made styrene rolls for holding covers in place in 'stuffing' gaps.

Observe methods of construction of removable covers

The aim was to understand and then become skilled in recommending construction methods for different styles of covers and fabrics.

The Fellow sought new knowledge and skills in joining methods, such as sewing machines, heat bonding equipment, or post production shaping techniques, plus machines and attachments that allow for consistent finish (top-stitching and other decorative finishing techniques) as well as new technology for joining seams, such as automated, fusion, adhesion, for machining leather and other new manufactured fabrics such as macro suede and coated fabrics.

Both design and construction of removable covers is done by experts. Each company had one or two employees who were highly skilled and experienced in this area, and they were remunerated accordingly. There was a preponderance of females to males in this area of expertise. Often the women came from dressmaking backgrounds, or had worked their way up in the company over a period of many years. Gender mattered little compared to the breadth of experience with different fabric characteristics which enabled them to predict the malleability and hence suitability of a particular cloth.

Machinists also had a hierarchy based on their ability to manipulate fabrics during construction to achieve the desired effect. Specialist machinists were used, and speed was not as highly regarded as accuracy and finish, especially with top-stitched leather. The sewing machines used are the same as are currently used in Australia. There were a few variations on attachments to enable greater accuracy when top-stitching leather. This seemed to be driven by operator preference.

Order of assembly of the components varied according to the cut and style of the individual piece of furniture. The finished product set its own imperative.

Investigate sustainable fabric sources such as fabrics from recycled materials or small carbon footprint materials, and differentiate factors that make some fabrics more suitable for removable covers

The aim was to understand and then become skilled in recommending appropriate fabrics for sustainable furniture, and compile a database of sources of material and equipment.

Two distinct lines of divergence are appearing in fabric use: a return to natural fibres that are grown and processed using eco-friendly, non-polluting technologies; and a scientific approach to fibres re-manufactured from recycled PET plastics.

The chemistry approach to creating fibres allows different characteristics to be engineered at the molecular level, producing fabrics that perform functions not found in natural fibres, such as filtering, moisture movement and control, enhanced colour control and contaminant shedding, etc. These fabrics are much more stable and flexible than those made from natural fibres, and can accept an almost unlimited range of permanent colours.

Natural fibres have an inherent carbon footprint: particularly wool, whose ovine source has environmental impacts of ruminant methane production and cloven-hoofed/overgrazing soil degradation.

Cotton crops have been traditionally associated with high pesticide use, although current GM variants are proving more resistant, and organically produced cotton fibre is available at a cost.

Processing cellulose-based fibres from trees and bamboo has a higher environmental cost. Bamboo cellulose is treated with sodium hydroxide, also known as caustic soda. The material is then combined with carbon disulfide to yield viscose. According to the USA's Environmental Protection Agency (EPA), *"several epidemiological studies of occupational exposures are available for carbon disulfide, which consistently point to peripheral neurotoxicity (damage to the human nervous system and/or brain) as a sensitive effect of long-term exposure in humans."*

In practical application, blends of natural and man-made fibres are found to provide the best combination of characteristics for upholstery covers.

Collect, record and analyse data on adhesive use in sustainable manufacture of upholstered furniture.

HM are conducting much research into cleaner, greener adhesives, and are currently developing an adhesive made from PET to simplify recycling. They are already using fabrics and solid components made from PET and hope to use developing chemical processes to produce all the components for a chair from the one source.

Water-based adhesives are becoming de rigueur, particularly in Europe where toxic solvent-based adhesives are largely outlawed. However, there are still problems with most brands and the self-cleaning action and quick drying time of solvent-based adhesives has not been successfully replicated yet for the upholstery industry. Pre-production foam fabrication can permit slow curing times, but production lines cannot be halted for glue to dry.

Removable covers over cold-cured injection moulded foam do not require any adhesives.

Visit appropriate places of learning to find out how they are introducing principles of sustainability into their curricula.

None of the institutes visited are currently teaching principles of sustainability at the practical furnishing design/production level.

Most Universities that the Fellow visited to conduct her research are just starting to teach sustainable practices. The College for Creative Studies in Detroit have had their interest in sustainability piqued by the Fellow's visit and have expressed an intention of introducing the topic into their design teaching. London Metropolitan University do little academic teaching at the Upholstery level—it is purely a 'how to' course.

Australia's national Furnishing Training Package is about to introduce Sustainability at all levels. The next version to be released (possibly during 2010) will introduce the three guide units of competency developed by Swinburne University. These are at levels 3, 4 and 5 of the Australian Quality Training Framework (AQTF). Attachment 2 is a draft copy of the Diploma of Sustainable Manufacture, developed by Manufacturing Skills Australia (MSA) to help small companies become compliant with legislation on their environmental responsibility.

The International Experience

From the MSA Website:

"Funding for sustainability skills – Australian Government's Workforce Innovation Program: Small- to medium-sized manufacturing enterprises: do you need to respond to the challenges of a low carbon and sustainable economy? Take advantage of funding to up-skill your existing workers.

NSW Strategic Skills Program:

- *Green Small Business Incentives of up to $1,000 are available for selected short courses for NSW manufacturers with up to 20 employees.*
- *The Energy Efficiency Training for Trades and Professionals Program is available to NSW manufacturers and covers up to 90% of training costs for selected short courses."*

Knowledge Transfer: Applying the Outcomes

The following actions need to be taken to promulgate the outcomes of this Fellowship into the Australian furnishing community.

- Deliver seminar of results all industry and government stakeholders, and to Critchlow's fellow educators.
- Develop and introduce the new MSA Sustainability Unit of Competency, which will be become mandatory at AQTF Certificate II level and above from 1 July 2010.
- Develop a short course for existing workers to up-skill their abilities to produce removable covers, and seek funding from appropriate government and industry bodies (MSA, FIAA, FURNITAC).
- Subsidisation for training in this area.
- Help is to be given to organisations to create a learning environment.

Why do these steps need to be taken?

- To educate educators and industry leaders on the importance of beginning the transition immediately.
- To educate apprentices and industry entrants on the way of the future, and give them the skills to demonstrate that they can contribute to a sustainable society.
- To educate existing workers to change the way things are done and become more sustainable on the shop floor.

Who should be involved in this educative project?

- All the leading upholstery manufacturers.
- The government agencies involved in the policy, development, and funding of training.
- Training package technical advisory groups, developers and technical writers and editors.
- RTOs who will be involved in introducing sustainability at the teaching level, and the staff that will be involved.
- Kim Carr, Federal Minister for Innovation, Industry, Science and Research; and Jacinta Allen, the Minister for Regional and Rural Development and Minister for Industry and Trade.

How can these approaches be made?

- Phone calls.
- Personal visits, improving dialogue between VET and Industry.
- Offers to develop removable covers free of charge to demonstrate skills and ease of production to all leading manufacturers.
- Arrange time off from teaching duties with the Fellow's employer to follow up on this.
- Creation of further partnerships with enterprises based on the Holmesglen/Bev Marks model.

When should the outcomes of the project be delivered?

- Now. We are at a critical state already and the furniture industry will go the way of the Australian Footwear and Clothing industries if something is not done soon.

Recommendations

The furnishing industry in Australia is reaching critical mass. If something is not done soon to turn the tide, it will be unable to sustain itself. Too much manufacturing has already left our shores. Here are some proposed actions the Fellow recommends that may have some impact on the future of this industry.

Government – Federal and State, Local as Appropriate

Recommendations:

- Fund research into affordable injection moulded seat forms. While Australia still has an automotive industry, perhaps link with them and find current knowledge through chemistry departments and university research from published papers and establish a think tank of people from all levels of invention to work on the problem of small runs.
- MSA to make LMF3007B 'Manufacture and Fit of Loose Covers' a mandatory unit in existing furnishing training packages.
- MSA to make sustainability a core unit in all national training programs (this is happening, but urgency must be increased).
- Provide incentives for sustainable practices in manufacture (note: MSA has recently advertised training in sustainability).
- Fund mature age training in short courses in specific skills for making removable covers.
- Educate small businesses on the availability of funding and incentives for apprentices to ensure that there is an increase in the uptake of training at a grass roots level.

Industry

Recommendations:

- Release the most skilled key workers for ongoing training in new methodologies. This may require the support of both government and industry associations to become a reality.
- An immediate increase in the number of apprenticeship training opportunities is required. Most apprentices are from small firms, and at present none of the large upholstery manufacturers currently have apprentices in training. Educate small businesses on the availability of funding and incentives for apprentices. This may increase the uptake of training at a grass roots level through organisations such as the Council of Small Businesses of Australia (COSBOA) or other organisations.
- The Fellow to visit all Australian Apprenticeship Centres and Skills Stores within the Melbourne CBD and surrounding regions and speak with the key personnel on these issues. These organisations are responsible for registering apprentices and trainees to all industry sectors, and advising on training and assessment options, such as RPL (Recognition of Prior Learning).
- Introduce the compulsory enrolment of the management-level staff currently working in furniture manufacturing companies, enrolling them in the current training being offered my MSA in sustainable practices. Provide incentives for promotion and implementation of sustainable practices in manufacturing (MSA has recently advertised training in sustainability).

Recommendations

- The local furniture industry must be convinced of the need to open their minds to sustainability, not as a philosophical concept, but as an economic imperative and social benefit.
- Industry to provide ongoing research and access to online journals dealing with the latest in sustainable manufacturing practices is to be undertaken for public distribution.
- The FIAA to fund and construct website devote to, and maintain a database of, fittings, fixings and construction methods for upholstered furniture.
- A database of accessories/attachments/adjuncts of the new methods of construction to extend the life of upholstered furniture to be made available to all furniture manufacturers in Australia.
- The FIAA website is to be linked to other websites specialising in sustainable fabrics and materials, such as www.geca.com.au. Submissions are to be sought from all sources on new materials discovered.
- Recommendations regarding the appropriate fabrics for sustainable furniture, and a database of suitable sources are to be maintained and made available.
- Links should be also included in the FIAA website regarding new adhesives as they become available, referencing comments from those that have used them with information regarding suitability, impact, and quality.
- Information is to become widely available regarding the appropriate adhesives for different upholstery applications, and to enable manufacturers to select from the range determined by cost versus sustainability factors

Professional Associations

The FIAA is our peak industry body but only communicates directly to its members, which precludes most small businesses. Apprentices currently enrolled in Victoria are predominantly from small businesses so it would be of benefit for the FIAA to advertise incentives for training through their website and distribution of newsletters to all employers in the industry, not just members. This would include apprentices, sustainability training for management and up-skilling existing specialist workers to develop loose cover templates.

Education and Training – University, TAFE and Schools

Recommendations:

- Enrol owners in current the training being offered by MSA in sustainability and small business.
- Develop courses and provide flexible training for teachers and existing workers with weekend and night delivery of short courses.
- Develop sustainability units with flexiblity to suit management and existing workers.
- Approach all manufacturers of new furniture in each state regarding the up-skilling of existing workers in loose cover construction.

Recommendations

- Skills Victoria is to provide specific funding for mature age training in short courses in specialised skills for making removable covers. These courses are from the LMF02 Training Package and would include Certificate III in Upholstery and Production Upholstery (LMF31002, LMF31102), Diploma in Furniture Design and Technology (LMF50508), and the Diploma of Interior Design and Decoration (LMF50408).
- Encouraging and funding enrolment in the new units included in the latest version of the Furnishing Industry Training Package LMF02 and educating the furnishing industry on sustainability.
- .• Furnishing teachers to immediately enrol in appropriate Units of Sustainability.
- To gain skills and knowledge in training and assessing the application of sustainability practices in the Australian upholstery industry, all furnishing teachers must be confident in their knowledge of sustainable practices. The development of the National Centre for Sustainability's Units of Competency in Sustainability, and Learner's Guide for Certificate III in Upholstery (Apprenticeship Course) must be completed as soon as possible.

ISS Institute

Recommendation:

- ISS Institute to support and fund further Fellowships into affordable small-run, metal-framed, injection moulded furniture as a priority.

Further Skills Deficiencies

Further investigation into the factors related to affordable injection moulded, cold-cured foam profile furniture is essential. This may require some thinking 'outside-the-square'. Improving the design of fittings, especially zips and Velcro is an absolute necessity.

References

Books

- Ayres, R U & Ayres, L W 2002, *A Handbook of Industrial Ecology,* Edward Elgar Publishing Limited, Cheltenham, UK
- Hawken, P, Lovins, A & Hunter Lovins, L 1999, *Natural Capitalism: Creating the Next Industrial Revolution*, Little, Brown and Company, New York
- Leydecker, S 2008, *Nano Materials in Architecture, Interior Architecture & Design*, Birkhauser Verlag
- *Polymers from Wood – Tenite Cellulosics*, n.d., Eastman Chemical Company
- Shedroff, N 2009, *Design is the Problem – The future of design must be sustainable*, Rosenfeld Media, Brooklyn
- *The Process of Making Trees into Plastic – Tenite Cellulosics*, 2001, Eastman Chemical Company

Websites

- Sustainable Furnishing Council, US, viewed 3 September 2010, www.sustainable furnishings.org

  The SFC is a non-profit balanced coalition of suppliers, manufacturers, retailers, and designers formed to promote organization in green furnishings with the best networking and education in the industry.

- IKEA, viewed 3 September 2010, www.naturalstep.org/en/usa/ikea

  In 1990, IKEA adopted The Natural Step (TNS) Framework as the basic structure for implementation of its environmental policy and plan.

- Patagonia, viewed 3 September 2010, www.patagonia.com

  Patagonia's definition of quality includes a mandate for building products and working with processes that cause the least harm to the environment. They evaluate raw materials, invest in innovative technologies, rigorously police waste and use a portion of sales to support groups working to make a real difference. They believe in using business to inspire solutions to the environmental crisis.

- College for Creative Studies, Detroit, viewed 3 September 2010, www.collegefor creativestudies.edu

  The College for Creative Studies hosted the Fellow in the US leg of the trip.

- Carnegie, USA, viewed 3 September 2010, www.carnegiefabrics.com

  Carnegie is an interiors textile company with a PVC free product line. They constantly search for environmentally sound materials.

References

- Milliken, USA, viewed 3 September 2010, www.milliken.com

  Milliken is one of the largest privately held textile and chemical manufacturers in the world, and is widely acknowledged as an international leader in research technology, innovation. It combines textile and chemical technologies in unique ways to serve a vast array of markets.

- Sustainable Living Fabrics, Oakleigh, Victoria, viewed 3 September 2010, www.green living.com.au

  Sustainable Living Fabrics are leaders in Australia for environmentally friendly fabrics for upholstery and vertical surfaces.

- Good Environmental Choice – Australia, viewed 3 September 2010, www.geca.org.au

  GECA is committed to credible product information for sustainable development.

- Chilewich Contract, US, viewed 3 September 2010, www.plynyl.com

  Chilewich's Upholstery fabrics are covered by the internationally recognized GreenGuard program certified by the GREENGUARD Environmental Institute. The goal of GreenGuard is to protect human health and quality of life through the reduction of chemical exposure and improve indoor air quality. This certification is also recognized by the U.S. Green Building Council and therefore our Upholstery fabrics also earn LEED points.

- Environ Biocomposites, US, viewed 3 September 2010, www.environbiocomposites.com

  Environ Biocomposites provide durable, affordable, environmentally friendly alternatives for the lumber and building industries. Their unique manufacturing process does not destroy trees; it utilizes recycled materials and abundant renewable agricultural resources.

- Herman Miller, US, viewed 3 September 2010, www.hermanmiller.com/About-Us/ Environmental-Advocacy

  Herman Miller believe the future quality of human life is dependent on both economic vitality and a healthy, sustainable natural environment. They do not see these goals as mutually exclusive, but inextricably linked. Mankind's future depends on meeting the needs and aspirations of a growing global population, while enhancing and protecting the ecosystem on which all life depends.

- Wendy Shorter Interiors, UK, viewed 3 September 2010, www.wendyshorterinteriors.co.uk

  Wendy Shorter is a member of the Association of Master Upholsterers and Soft Furnishers and has adopted their Code of Practice.

- Ecospecifier Australiasia, viewed 3 September 2010, www.ecospecifier.org

  Ecospecifier's aim is to help building professionals including architects, designers, builders and specifiers, as well as keen homeowners, to shortcut the eco and healthy materials sourcing process. Its broader aim is to help create a more sustainable physical environment by increasing the use of environmentally preferable and healthy products, materials and design processes.

References

- Business and Institutional Furniture Manufacturer's Association, Michigan, viewed 3 September 2010, www.bifma.org

  BIFMA International announced the release of BIFMA e3-2008 Furniture Sustainability Standard to the American National Standards Institute (ANSI) in June of 2008. The standard is an open, consensus based method to evaluate the sustainable attributes of furniture products. It addresses all three aspects of sustainability (environmental, economic and social) and includes criteria for evaluating human & ecosystem health, energy, natural resource and corporate social responsibility impacts. The standard is downloadable here: http://bifma.org/public/SusFurnStdArchive/Draft/2009-02-20%20e3.pdf

- British Furniture Manufacturers Environment Ltd, UK, viewed 3 September 2010, www.bfmenvironment.co.uk

  During early 2009, BFM Ltd completed a two year study regarding the scope for the attainment of zero emissions production in the furniture manufacturing sector. There have been a wide range of interesting outcomes which have greatly contributed to the level of knowledge regarding the methods through which environmental progress can be made by the office, contract and kitchen furniture supply chain.

- The Australian Research Institute in Education for Sustainability, Australia, viewed 3 September 2010, http://www.aries.mq.edu.au

  ARIES specialises in education, participatory change and learning for sustainability, working with action research and other change management techniques and methods. Our success is based on a strong participatory approach to change management, stakeholder engagement and organisational development.

- Online video: 'The story of stuff' – A 20-minute animation of the consumerist society, narrated by Anne Leonard, to view online or download, www.storyofstuff.com

Attachments

Attachment 1

List of Countries and their Green Building Programs

- South Korea: Greening Building System (http://web2.me.go.kr/kor/auth)
- Japan: CASBEE (http://www.ibec.or.jp/CASBEE/)
- Australia: Nabers/Green Star (http://www.nabers.com.au/faqs.aspx and http://www.gbca.org.au)
- Brazil: AQUA/LEED Brasil (http://www.vanzolini.org.br/ and http://www.gbcbrasil.org.br/pt/)
- Canada: LEED Canada/Green Globes (http://www.cagbc.org/ and http://www.greenglobes.com/)
- China: GB Evaluation standard for green building (http://www.risn.org.cn/Norm/xxbz/ShowCalib1.aspx?CalibID=60043&IsEdit=False)
- Finland: PromisE (http://www.vtt.fi/)
- France: HQE and Carbon Site (http://www.assohqe.org/ and http://www.greenlogic.fr/EN/chantiercarbone.php)
- Germany: DGNB (http://www.dgnb.de/)
- Hong Kong: HKBEAM (http://www.hk-beam.org.hk/)
- India: GRIHA (national green rating)/LEED India (http://www.teriin.org/index.php?option=com_content&task=view&id=73&Itemid=32/)
- Israel: SI-5281 (http://sviva.gov.il/bin/en.jsp?enPage=e_BlankPage&enDisplay=view&enDispWhat=Zone&enDispWho=israel_green&enZone=israel_green/)
- Italy: Protocollolta ca (http://www.itaca.org/)
- Mexico: LEED Mexico (http://www.mexicogbc.org/)
- Netherlands: BREEAM Netherlands (http://www.dgbc.nl/)
- New Zealand: Green Star NZ (http://www.nzgbc.org.nz/)
- Portugal: Lider A
- Singapore: Green Mark and Construction Quality Assessment System (http://www.bca.gov.sg/GreenMark/green_mark_buildings.html and http://www.bca.gov.sg/professionals/iquas/conquas_abt.html)
- South Africa: Green Star SA (http://www.gbcsa.org.za/)
- Spain: VERDE
- United Arab Emirates: Estidama (http://www.estidama.org/)
- United States: LEED/Green Globes (http://www.usgbc.org/ and http://www.TheGBI.org/green-globes-tools/
- United Kingdom: BREEAM (http://www.breeam.org/)

Attachments

Attachment 2

Sustainability Units of Competency from MSA

This draft copy of the Diploma of Sustainable Manufacture has been developed by Manufacturing Skills Australia (MSA) to help small companies become compliant with legislation on their environmental responsibility.

MSA will work with enterprises to identify training needs in skills for sustainability. Units of competency to be delivered and assessed will include one or more units from the list below.

Sustainable Manufacturing	
MSAENV272A	Participate in environmentally sustainable work practices
MSAENV472A	Implement and monitor environmentally sustainable work practices
MSAENV672A	Develop workplace policy and procedures for sustainability

Plus one unit from any of the following levels:

Sustainable Operations	
MSACMS200A	Apply competitive manufacturing practices
MSACMT270A	Use sustainable energy practices
MSAPMSUP200A	Achieve work outcomes
MSACMT271A	Use sustainable environmental practices
Implementing and Monitoring Sustainability	
MSACMS400A	Implement a competitive manufacturing system
MSACMT450A	Undertake process capability improvements
MSACMT452A	Apply statistics to processes in manufacturing
MSACMT453A	Use six sigma techniques
MSAPMSUP172A	Identify and minimise environmental hazards
Design and Development for Sustainability	
MSAPMOPS400A	Optimise process/plant area
MSAPMSUP300A	Identify and implement opportunities to maximise production efficiencies
MSACMT650A	Determine and improve process capability

Attachments

Plus one of the following units:

Sustainable Operations	
MSACMT452A	Apply statistics to processes in manufacturing
MSACMT281A	Contribute to the application of a proactive maintenance strategy
MEM15011B	Exercise external quality assurance
MEM16014A	Report technical information
Implementing and Monitoring Sustainability	
MSACMS601A	Analyse and map a value chain
MSACMS602A	Manage a value chain
MSACMT453A	Use six sigma techniques
Design and Development for Sustainability	
MSACMS600A	Develop a competitive manufacturing system
MSACMT653A	Apply six sigma to process control and improvement
MSACMT670A	Develop and manage sustainable energy practices
MSACMT671A	Develop and manage sustainable environmental practices
MSACMT675A	Facilitate the development of a new product
MEM22007A	Manage environmental effects of engineering activities

Attachments

Attachment 3

News – From MSA Website, Downloaded 25/11/09

17 Nov 2009 – Funding available to SMEs for training in sustainability skills

An exciting opportunity exists for small- to medium-sized manufacturing enterprises to upskill existing workers in skills for sustainability, with funding support from the Australian Government's Workforce Innovation Program.

MSA will work with enterprises to identify specific upskilling needs for skills for sustainability; develop training plans and arrange for training delivery by a Registered Training Organisation (RTO).

Workers will receive nationally accredited training in selected units of competency that address sustainability skills needs.

Minimum eligibility requirements are as follows:

- the enterprise must be either small (employing less than 20 people) or medium (employing 20 or more, but less than 200 people)
- existing workers who receive the training must hold an accredited Australian vocational qualification
- employer to contribute an upfront payment of 50% of the upskilling training costs per existing worker (a 50% share is estimated to be $750 per worker)

If you would like to take advantage of this unique opportunity, contact MSA's Workforce Development Manager, Nick Juniper on 02 9955 5500 or 0419 472 106.