

## **The value of textile education and industry partnerships**

## **ABSTRACT**

*Textile research/industry partnerships have recently gained momentum in New Zealand. This paper makes a preliminary account by focusing on the benefits of the collaboration to Massey University Master of Design postgraduates, companies and the academics. The students work on a significant problem faced by a company to rejuvenate business or to produce solutions for a particular or a set of problems. The company gains access to new university research and discoveries and faculty members complement their own academic research by securing funds for graduate students.*

*During a one-year period the students receive a government funded scholarship and industry mentoring. The aim is to steer success across the textile value chain from economic and environmental perspectives whilst balancing academic requirements. Typically, the industry centred design is developed using iterative processes with a strong emphasis on the role of technology, often requiring the acquirement of new software skills to design with industry equipment. The model establishes best practice to share resources and experiences within the thrust of daily industrial life and the demands of a Master of Design degree.*

*This paper aims to gauge the benefits of, and challenges in a range of wool-centred collaborative projects from yarn development to sustainable dye to bedding product development to the revitalization of a weaving mill innovative waste to blue sky solutions for a tannery. The research of novel ideas and process innovation leads to enhanced job placement opportunity and new exports.*

## **Key words**

Design, industry, collaboration, innovation, value added

## **Introduction**

“Partnerships in university-industry research are important social experiments in the generation of innovation” is the view held by Yong Lee, an Iowa State University academic, following his research of partnerships in the United States (2000:111). This paper considers the perceived benefits of some recent New Zealand postgraduate student/industry partnerships and whether or not the societal objective of economic development is achieved.

The College of Creative Arts (COCA) textile postgraduate students research and development (R&D) encompass significant problems faced by a company to rejuvenate business or to produce solutions for a particular or a set of problems or undertake blue skies research to propose design new products or processes. They connect and collaborate with the manufacturing sector, turning ideas into reality to help make better, more customized, niche and advanced textiles. In a team effort industry partners are required to maintain an ongoing

relationship, mentor the researcher and network with the university. Across a broad spectrum of projects, design curiosity and creativity intersects with manufacturing processes, technologies and systems.

My interest in industry/education initiatives began in my doctoral research, that included an evaluation of the impact of thread-makers, J & P Coats on textile design education (2004).<sup>1</sup> Coats achieved their influence through very clever, often veiled strategies. Today's education/industry partnerships are of a different type and model.

### **A government education initiative**

Responding to economic needs the New Zealand Ministry of Business, Industry and Environment (MBIE) provides funded Callaghan Innovation opportunities for technology focused postgraduate projects to contribute to the development and commercialization of a new product, process or service (2016). The policy perspective is to fund new university thinking and technology ideas by offering a student stipend of NZ\$20,000, plus \$1000 for travel and accommodation.<sup>2</sup> While working in industry the student gains access to a range of traditional equipment, different technology and technical R&D experience and expertise. A close link with the university results in the transfer of knowledge to industry often requiring the development of new software skills. The fellowship overcomes designer employment budget issues, an investment that is more than a company can manage based on challenges provided by a changing international market. At the outset companies must prove due diligence and have an active R&D programme.

The MBIE funding application process is lengthy and requires design to be couched within the technology framework. In the application development process stakeholder

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<sup>1</sup> J & P Coats were thread-makers based in Scotland and owned a significant number of mills throughout the world. They established the Needlework Development Scheme from 1934-62 to inspire embroidery design and sell more threads.

<sup>2</sup> Equivalent to approx. 9,100 British pounds. Retrieved from [www.xe.com](http://www.xe.com)

discussion leads to the definition of key topics or needs. The initial application process includes the development of a systematic progression of work, proceeding from hypothesis to experiment, observation and evaluation, practical and speculative design, and leads to logical conclusions and outputs. Together we determine where we can make the most impact and the application frames ideas in a commercial sense. Several factors coalesce in the application process, including careful selection of an appropriate postgraduate fellow in terms of academic ability, personality and future desires.

The Callaghan Innovation student fellowships are less generous and broad ranging than United Kingdom's Knowledge Transfer Partnership (KTP) scheme (2015). Managed by the British Technology Strategy board the KTP strategy is to improve businesses competitiveness and productivity through part funding of £60,000 (2015).

### **The New Zealand wool industry**

The fortunes of the New Zealand textiles industry have waxed and waned over the years and it faces new challenges as consumer demands evolve and change (TextilesNZ 2013). Tariff regulations introduced across several decades followed by competition with China reduced profit margins for both farmers and manufacturers. This challenging environment narrows or reduces the ability of companies to employ designers. From 2007-2012 NZ wool industry reports overlooked the potential role of design to improve the added value, attractiveness and viability of wool products for export (Faulkner 2012; Conforte, 2011; Sheldon, 2007). In Sandra Faulkner's Nuffield funded report "Hello New Zealand-This is the Future Speaking" she declared, "we have extraordinary innovation, developers, designers and marketers within our own wool grower ranks. Our future is there now (2012:27)."<sup>3</sup> The contribution of designers, other than wool-growers, was not mentioned in the report.

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<sup>3</sup> Nuffield are a farming trust that offers scholarships.

A report for the Ministry of Primary Industries (MPI) identifies the increasing importance of the demographics and demands of markets, changing from our traditional markets (Grimond, Bell, Yap 2014:10). It notes key factors, “Consumers are becoming more discerning and are looking for food and fiber that suits their tastes and lifestyles, along with greater assurances around social license, environmental sustainability, animal welfare and food safety (2014: 8).” The strategy is to increase the amount of value added to primary commodity production in New Zealand to improving export earnings and calls for better processing innovation for fibre/wool.” One important limitation is the recommendation of skills such as STEM (science, technology, engineering and mathematics) (Grimond, et al 2004:10),” overlooking the value of design.

### **Focus on wool**

To date, a key focus in the collaborative projects is R&D associated with wool, as a quality niche fiber, which makes up 80 percent of the New Zealand natural fiber clip.<sup>4</sup> Access to the new manufacturing processes and technological advances multiply the wool fiber properties and material qualities, leading to the diversification of applications. It allows the development of new generations of wool fiber blends. For example, Levana Textiles in Levin, use new processing technology to remove yarn twist by lying fibers in parallel orientation to create a yarn with greater warmth, strength, loftiness, comfort, elasticity, and shape retention (NuYarn 2015).

**See Fig 1 & 2**

### **Aims and research questions**

This discussion case study aims to contribute to the value added through design debate by comparing and contrasting the design contribution of a cluster of postgraduate projects from 2012 – 2014. It offers ways in which the students mentored by industry and academics, turn industry focused ideas into commercial reality. It asks what is the value of an engagement

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<sup>4</sup> Wool clip is the total amount of wool shorn in a particular year.

between creative textile design practice and manufacturers, within the context of the wool industry? Are education/industry partnerships effective within this context? And what are the benefits both to the students and each sector? What are the reasons for focusing on wool? Are issues of sustainability and social responsibility integrated?

Before analyzing the partnerships, this paper discusses underpinning issues including: the status and value of design both within and beyond the textile manufacturing industry; sustainable development; the value of design; value added: creativity, innovation, and education; and motivations for wool innovation. To explore the questions, the reasons for intervening in the traditional manufacturing process are considered. Whether or not government support for students and manufacturing ensure knowledge and skills merge for a mutual benefit, is a key discussion.

### **Confidentiality**

The caveats of upholding confidentiality need to be noted regarding the present study. It is necessary, as commercially sensitive specifics within the projects must not be revealed and intellectual property protected. An important limitation is the small number of projects. Caution must be applied with a small sample size and findings may not be transferable to different geographic and economic circumstances.

### **Sustainable development**

In 2013, a Creative Industries Symposium held at COCA looked at how New Zealand could maximize the potential of its creative industries to drive sustainable growth and exports. One of the high profile contributors, Sven Baker, chief executive of *Designworks*, provided an analysis, describing New Zealand's traditional primary industry manufacturing operations as "*vulnerable old economy businesses with latent opportunities* (2014)." Reinforcing his position he quoted former General Electric CEO, Jack Welch, "*If the rate of change on the outside exceeds the rate*

*of change on the inside, the end is near* (Welch, 2005).” Baker cites the New Zealand company, *Icebreaker* as a role model for their work re-imagining what merino wool could do for the adventure clothing market and recommended industries focus onto developing narrow niche products.

Across the other side of the globe positive social and environmental perspectives on innovative business development were presented by Lester Mills, Head of New Business Development at *BASF Corporation*, Switzerland, at a Commonwealth Secretariat Global Fibre meeting, in London. He urged participants to consider both the process and impact of the process of production to add value and take the initial concept beyond industry. Mills defined sustainable development as meaning ‘*the combination of long term orientated success with environmental protection and social responsibility* (2013).’ He identified the need to use clearly defined processes, sustainability innovation networks and a comprehensive awareness of target markets. Underlining all this is social responsibility and a questioning of how much we should tamper with nature to meet end goals.

Innovation is widely recognized as a fundamental for change in both design education and industry. Mills emphasizes the need for innovation to be integrated in fibre value chain development stating “*Innovation is the key to drive sustainability solutions, and partnerships are the way to steer success.*” Earlier, in the UK, at a summit to showcase the role of creativity and design in UK competitiveness, the Design Council report author Sir George Cox argued “*innovation will dictate the economic prosperity of nations* (2007).” Additionally, the design council chief executive for over a decade, David Kester defined design as “*what links creativity and innovation,*” and “*creativity deployed to a specific end* (2007).” He reflected on “*the trend for emerging economies—including China, India and New Zealand—to embrace design and creativity.*”

## **Value of design**

The value of design is widely recognized within the debate with governments in a parallel manner with innovation. David Kester published a report in the UK Government Innovation review, emphasizing the importance of design by encouraging the British government to “*think of design not as a chapter but cut across all the government’s innovation policies* (2013).” He defines the importance of design within innovation “*design is a force that can drive innovation, never an after thought or an embellishment.*”

There are both similarities and differences with NZ’s situation. Simon Mark (2014) drew attention to the importance of design writing that design barely features in New Zealand government science and innovation policy, despite international evidence attesting to design’s role and impact in innovation. Kester believes more evidence is required “*from a policy perspective to ensure funding to universities is linked to new thinking and new ideas* (2013).” A traditional approach with a new slant would simply add design to the industry manufacturing process. The other case is for industrially produced textiles to offer a new design process perspective such as, design combined with science or design with science and engineering along-with good economic and target market analysis. The sequential development evident in the MDes projects offers some evidence, as inter-government institutions take design more seriously, offering support.

In Australia, government reactions against the trend to manufacture offshore, in particular in Asia, have some momentum. The Victorian State government committed AUS\$7.5m to building an advanced manufacturing sector, including AUS\$40,000 to the Design Institute of Australia (DIA) to promote advanced materials manufacturing in Australia (2014). It recognizes the role of educators by including them in DIA’s ‘*Materian*’ initiative that will bring together designers, manufacturers, researchers and educators to explore opportunities for new applications and opportunities for advanced materials.

**Value added**

The key issue resonates round the recognition of the added value of design within the manufacturing industry and the factors that contribute to this situation. As part of its future capability report MPI report drew attention to the importance of innovation and skills to meet market demands. It called for changes across the value chain, *“if we’re going to achieve a doubling of exports, the majority of that increase will come further down the value chain, away from the point of production (Grimond et al 2014, 4).”*

In *“It’s the future of New Zealand,”* Jeremy Baker, Lincoln University’s deputy vice-chancellor, analyses the report and for the first time he identifies the need for design, *“You can’t just do the science – you’ve got to actually get the design and creative flair and inspiration to turn the product into something that customers want to buy and then you’ve got to have the business acumen to put the supply chain in place to get them through to the market. [...] We need a lot more science, a lot more design and a lot more business acumen. If we’re successful, we will see more people working in the design of the products we sell, innovating and creating to find new, more valuable ways to produce them (2014: 2).”*

### **Creativity, innovation and education**

Turning now to issues influencing education and industry including creativity, innovation and education. Ken Robinson argues that creativity and innovation alone are the key to the future; claiming knowledge won’t suffice and isn’t even necessary (2007). He argues acquiring knowledge is therefore a waste of time. He defines creativity, *“as the process of having original ideas that have value — more often than not comes about through the interaction of different disciplinary ways of seeing things.”* Textile design is a natural place for multi-disciplinary R&D. In *“Textile Thinking for Sustainable Materials,”* academics, Faith Kane and Rachel Philpott quote Elaine Igoe, writing *“Textiles are a site where creative and scientific disciplines find a natural meeting point, providing a unique platform for interdisciplinary dialogue and innovation. As an interdisciplinary site, textiles encompass aspects of design, art, craft and technology, indicating*

*those involved with textiles possess a special blend of knowledge* (Igoe in Kane and Philpott 2013: 4).” Sir Christopher Frayling, the former rector of the Royal College of Art in London, identifies tacit knowledge as an important aspect in design and the application of technology completes the design process (2015). He believes craft knowledge at the front end of the design process is more important than ever before. Frayling states his key aspects to research-led design as, “*specialism is very important, research must appeal to young people and they should be paired with ethnography or business.*” van Bezooyen emphasizes the need for knowledge and skills through “*hands on experience of properties such as texture, processing qualities, colour, stiffness, and sometimes smell* (van Bezooyen, 2014).” In the postgraduate projects, physical material contact is very important as material intuition develops through experience and practice. Techniques may include imaginations, interactions, use, associations, sustainability, metaphors and reflective thinking.

### **Motivations for wool innovation**

In Wellington, the need for more relevant wool/materials focused curriculum was identified in 2007. An extended process ensured the development of the textile structures curriculum, including visits from overseas experts who provided springboards for new paper and content development.<sup>5</sup> Later, wool focused postgraduate research advanced these initiatives and used design in its broadest sense, using design as a promoter of social change to create objects of desire and value. Amy Pyle’s “*The Woolshed: an Exploration of New Zealand Vernacular*” advanced material innovation using a combination of old and new creative technologies to

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<sup>5</sup> Joy Boutrop, a Danish textile engineer was invited to textile design at Massey University to advocate for new approaches in wool material development in a two week a Master class. Boutrop emphasized the important role of textiles in culture and the essential need of good textiles, which comply with new environmental regulations. The overwhelming success of this initiative led to another international invitation in 2008. Then, Wilma Korenromp from the Design Academy Eindhoven, led a two week Master class and was a keynote speaker at the Material World symposium at COCA.

produce a range of contemporary textiles (2011). Kristy Johnstone's "*Colours of the high country*" research explored place through color in sustainable dye application (2011).

### **Engagement with entrepreneurs and industry**

A precedent to the government funded industry partnerships was Stacey Ellis' research entitled "*Transforming Waste*" (2012). (see figure 3) Ellis designed innovative material solutions to highlight the cost of waste wool disposal problems in industry and challenge the traditional industry design process.<sup>6</sup> Alongside this Ellis completed R&D to produce the first rice straw/wool woven designs for entrepreneurs, The Formary, to present to the Chinese government. Combinations of different fibers and different techniques are required to provide a fresh look or fresh point of view. Freshness in design is an aspect highly valued and encouraged by the renowned designer Hella Jongerius (2014).

### **Partnerships - developing the postgraduate research/industry model**

The formal development of the industry partnerships was a response to industry interest in Ellis' textile design and proposals to industry by academics. The suggestions ranged from solving specific problems to the development of new processes and products to blue sky exploratory research. At the outset of the application process the reason for doing the project is already established, but the student's vision and approach needs to be developed. Typically, in the industry-centered design (ICD) research methodology students must scope potential of their industrial collaboration. Abstract thinking throughout the next stage lays the platform for innovation. Iterative, experimental and material responsive design processes are followed with a strong emphasis on the role of technology.

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<sup>6</sup> Ellis received a scholarship from Woolyarns Ltd.

**Manual work and the understanding of the limits of a material are developed through trial and error.**

The ICD methodology encompasses aspects of desirability, feasibility, and viability identified within the design challenge. Thinking oscillates from concrete to abstract to concrete at different stages in the process. The students must maintain a dialogue with key industry personnel and dedicated project leadership by academics and industry mentors ensures a common understanding of the goals to guide the application of research and knowledge transfer.

The projects contribute to the development or maintenance of an ongoing relationship with the university. Within the design process students and industry mentors work in meticulous, methodical and adventurous ways. The results are uplifting in a creative, commercial and educational sense. It is important to note that to establish these projects the academic leading the collaboration needs a great deal of enthusiasm, commitment and time to ensure a sound platform is established for project success.

### **Textile design and science perspectives**

The first industry/government funded partnership was Rebekah Harman's "*Designing Sustainable Colour: Lowering the Environmental Impact during the Wool Dyeing Process* (2012)." The R&D linked textiles, dye science and environmental impact knowledge.<sup>7</sup> Following this, some projects ran alongside government funded science R&D projects. Michelle Macky's (2013) project from "*Waste to Textiles*" progressed in parallel to a project by scientists who were committed to finding new environmentally friendly and energy efficient ways of processing rice straw fibre. **(see figure 4)** Whereas Kelly Olatunji's (2013) "*Capturing loft*" progressed alongside a Lincoln University PhD science project for FibretechNZ, a bedding manufacturing firm in

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<sup>7</sup> Harman received a government stipend from the Ministry of Science and Innovation Capability Education Fellowship grant (later the name was changed to Callaghan Innovation Student Fellowships).

Christchurch.

## **New technology**

Access to new spinning technology was key to Monique Bowers' (2014) "*New Zealand's NuYarn*" innovative yarn spinning and circular knit design and Hannah Webster's (2014) 'The revitalization of a weaving mill' R&D included plans to use new digital looms but they were not commissioned in time for her to benefit. **(see figures 5&6)**

## **Analysis**

### **Insert tables Partnership textile design challenge**

### **Insert tables Job placement**

### **Insights of benefits to students**

Table three outlines the challenge faced by each student and the resultant textile career opportunity. The students gain valuable commercial insights and experience, enhancing their career prospects. The model establishes best practice to share resources and experiences within the thrust of daily industrial life and the demands of a postgraduate degree. New vitality is injected to New Zealand's wool industry and commercial ventures. The success stories signify new developments in an industry that previously undervalued the role of the textile designer. They provide significant opportunities for industry to add value to products.

### **Problems encountered**

Delays experienced by students while waiting for fellowship approval may prevent them from either seeking or accepting other work. During the projects, the most significant problems faced are production line delays as these have a rapid impact during the twelve-month time frame.

Poor industry mentor communication due to the pace of the workplace, company staff workload and budget issues may require a mature and tolerant student approach.

### **Faculty experience**

Academics are motivated to promote student research, job placement opportunities and a positive future for textiles in New Zealand. The university's connections are extended and knowledge gained about industry problems is useful for teaching and research purposes.

A significant amount of time is required to nurture industry/university relationships and support the development of fellowship applications. During the projects, challenges of project “creep” or “stretch” require academics to insist agreed boundaries are respected. The academic may need to initiate a legal ‘Variation Order’ and ensure it is signed to avoid future mis-understandings.

Clear communication is necessary, including the preferred mode of communication and time of week, for example, conversations late on Thursday afternoons are often more effective than at the beginning of the week. The academic must always respect commercial priorities to avoid unwanted dis-agreements. Extra funding for student travel, or the donation of in-kind products from other companies may need to be found to ensure the student's situation continues to be fair and reasonable. Additionally, the academic may need to quietly lobby government officials for more relevant application content. Intellectual property issues are rare as the agreement is clear from the outset. Students return the benefits of their research to industry in return for the government stipend.

### **Insert table Benefits to industry**

### **Insights of benefits to industry**

Industries gain access to university research and discoveries and the development of novel ideas, process innovation, new technology applications and products (see table 2). Intellectual

property is owned by the company and the new capability generated in the project is transferred to the business. Several project outputs have been commercialized. The students have contributed to teams who have attracted new clients, including leading sportswear companies, Adidas and Nike.

Other contributions to teams working on science/design problems have resulted in the development of breakthrough concepts for higher performance textiles and more appealing products. This view was underlined by Peter Sheldon, chief executive of FibretechNZ, at the Creative Industries Symposium, stating, "*we need closer relationships with universities, in particular science and design to release the latent value of wool fibre* (2013)." This is a significant departure from the earlier directions overlooking design in the "NZ Wool Sector Science Strategy" (2007) by the chairman, Sue Sheldon, who is also co-owner of FibretechNZ.

## **Partnerships**

The industry R&D partnerships link for the first time vital elements in the value chain into a network: design researchers and industry stakeholders. New knowledge, student competency and capacity extend to produce a high level of technical and design expertise. They help to mitigate the impact of manufacturing in China and satisfy emerging consumer needs. Returning to the recommendations of BASF's Lester Mills for the need for innovation to drive sustainability solutions, and partnerships to drive success' we find these attitudes and values upheld by Ellis, Harman and Macky. The partnerships create a meaningful difference, niche products that are unique and well executed through high quality design and production.

Aligned alongside science, engineering and other approaches the impact can be further strengthened in industry focused R&D projects. Building on the successes, in 2015, an international holistic, cross-disciplinary R&D approach established a collaborative team of three students (fashion, industrial and spatial design), a non-woven engineering manufacturer, scientists at AgResearch, Massey University academics and WoolFresh CEO, Darrius Glover, a

Harvard University MBA graduate. The multi-disciplinary WoolFresh team developed an odour absorbing anti-microbial wool material and a wool/leather sports bag (WoolFresh). The Llana bag is currently in the first stage of New Zealand production for commercialization in United States of America.

## **Conclusion**

The evaluation of design in research activity to drive innovation reveals the students used the purest raw materials and the most up to date production finishes to create products with a unique and well-designed finish. Fusing cutting edge design ideas, science perspectives, craft skills, tacit knowledge with the use of both university and industry equipment and technology, the students provided solutions to economic, environmental and social problems. The integrated use of old and new creative technologies, a variety of technical structures and finishing processes within design offered new solutions to make effective contributions to industry. Finally, some businesses add a compelling story of reduced environmental impact combined with the marketing of specific new performance qualities of the finished product.

This paper has given an account of a spectrum of new directions and the reasons for the rapid increase in postgraduate R&D mentorship programmes in the textile manufacturing industry. One of the more significant findings to emerge from this study is that the stipend encourages graduates to remain in New Zealand to undertake postgraduate study and participate in the textile industry. The projects offer enhanced employability prospects (as listed in table 3) and graduates are now receiving social enterprise enquiries from a wide range of people applauding their contributions. Novel and innovative wool focused niche products have contributed an optimistic outlook in a challenging environment.

Typically the collaboration generates new knowledge in the form of new or improved materials or products to create value and reduce the fiscal risk of the business. The student fellowship contributes to the development and commercialization of a new product, process or a

blue skies concept and process requiring processing by a third party. The students gain commercial experience and the new capability and innovation generated in the student's project is transferred to the business contributing to an increased economic performance.

## **Future**

Taken together, these findings do support strong recommendations to academia, government, industry and the media to recognize and value the difference textile designers can make. Projects to date provide sufficient evidence that more financial support should be offered to engage students in new projects and to contribute research to solve new industrial problems.

## **Note**

I would like to express my gratitude to graduates, colleagues, industry and government partners.

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## Tables

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2. Benefits to industry
3. Job placement

## Figures

Fig 1. Wool sliver prior to spinning at Levana Textiles.

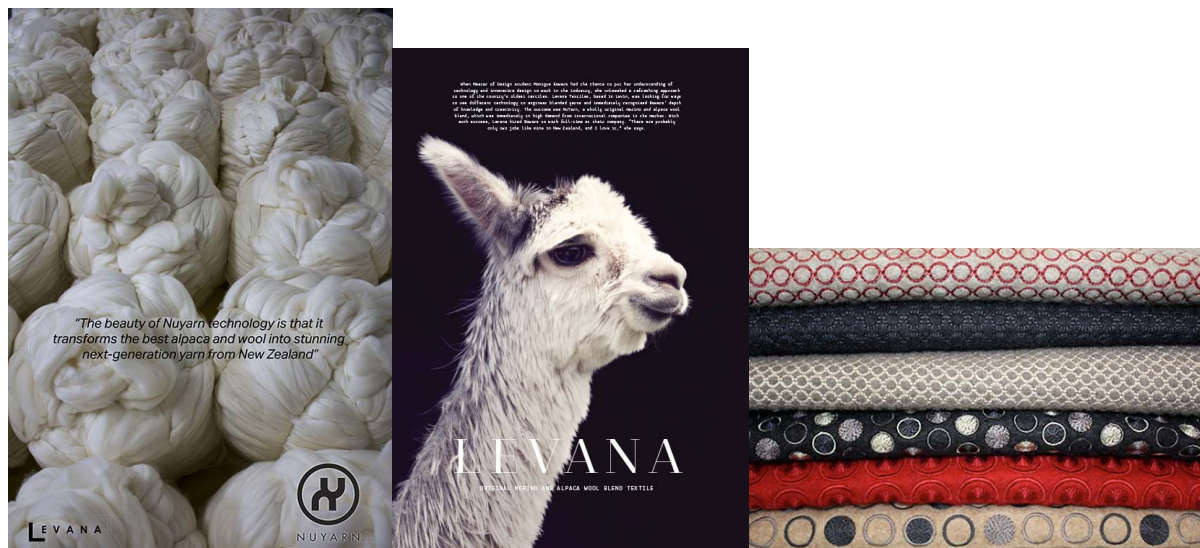
Fig. 2 Alpaca/wool NuYarn image used in COCA promotional material.

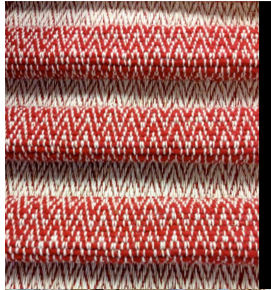
Fig. 3 A collection of digitally embroidered felted waste wool fibre by Stacey Ellis. Photograph by Stacey Ellis.

Fig. 4 Michelle Macky's wool/rice straw woven cloth depicted on Facebook

Fig. 5 Hannah Webster's drawing and design within woven cloth process

Fig. 6 Loom at weaving mill.





**The Forinary**  
Liked · July 17, 2013 · 0

Our latest fabric is a marriage of waste straw from rice harvesting and beautiful wool. Diverting the straw from being burnt (which results in millions of tonnes of ash in the atmosphere every year) finding carbon reducing and beautiful solutions for this overlooked fibre.

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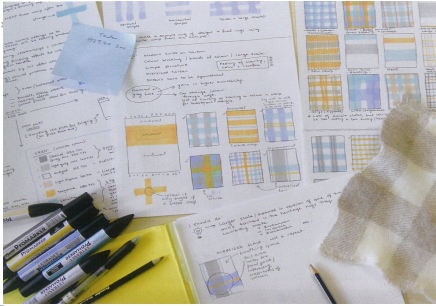
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**Denise Hesley** Lovely Bernadette Casey  
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**Rita Kerk** That is very good!  
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*This focus for designers on industry will hopefully arrive just in time to prevent the demise of the textile industries. We have only a few years left to save these endangered species.*

- Li Edelkrant 2014