

**mistra future fashion,
annual report 2012**
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Swedish Chemicals Agency
TvNo Textilservice AB

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fashion



annual report 2012

directors' view

2012 was a year of cross-fertilization within the MISTRA Future Fashion program (MiFuFa). The “seedlings” that were planted to stimulate cross-disciplinary collaboration between projects in the first year, grew and developed this past year. A more detailed description of this is presented in the section on interaction in this report.

All stakeholders (researchers, designers and industry representatives) in MiFuFa are focused on substantially improving the sustainability of the fashion industry. Achieving this may require systemic change – an undertaking possible only if designers, social scientists and natural scientists work together. A scientist’s knowledge of new materials is beneficial when designers can explore these materials and their potential. Materials developed by scientists are tested by designers – who provide feedback on what needs to be improved. Scientists then modify the materials in response to designer feedback. Much in the same way, the MiFuFa team investigates the requirements of new business models using input from consumer behavior studies and feedback from industry representatives considering the current business climate.

It is clear that scientists gain important insights and motivation when working together with researchers from other fields and with industry partners. Through close collaboration, they reach new, unexplored areas and broaden their views – this creates value for the whole program.



Mats Westin
Program Director



Åsa Östlund
Deputy Program Director



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this is mistra future fashion

The program is organized in eight research projects:

p1. Changing markets & business models: Towards sustainable innovation in the fashion industry

p2. Clarifying sustainable fashion

p3. Interconnected design thinking and processes for sustainable textiles and fashion

p4. Moving towards eco-efficient textile materials and processes

p5. Reuse, recycling and end of life issues

p6. Fashion for the public sector

p7. Sustainable consumption and consumer behavior

p8. Policy instruments

The purpose of the Mistra Future Fashion Program is to deliver knowledge and solutions that the Swedish fashion industry and its stakeholders can use to significantly improve the fashion sector's environmental performance and strengthen its global competitiveness.

The program is structured so that it leverages the expertise and networks of leading Swedish and international research institutes and universities.

Stakeholders engaged in the program include governmental agencies, voluntary organizations, and companies within the entire textile value chain: forestry, pulping, textile manufacturing and recycling.

To ensure that the program delivers insights and solutions beneficial to the fashion industry, representatives from business, government and civil society are also actively involved as advisors for each of the program's eight research projects.

Ultimately, Mistra Future Fashion aims to create a dynamic and robust relationship between the research community and practitioners working in, or in close cooperation with, the Swedish fashion industry, thus ensuring that Sweden and its Nordic partners take the lead within sustainability research and practice related to the fashion industry. The program is a significant step towards the creation of a national platform for research within sustainable fashion.

Program Funding

The turnover for Mistra Future Fashion is expected to reach a minimum of SEK 110 million over an eight-year period (2011–2019). The primary funding organization is Mistra, the Swedish Foundation for Strategic Environmental Research, which supports the program with SEK 40 million during the first four years. Mistra will plausibly support the program with an additional SEK 40 million during phase two. Additionally, industrial partners co-finance phase one of the program with resources valued at over SEK 16 million.



voices on mistra future fashion



Ulf Carlson
Dean of Department of
Chemical and Biological
Engineering,
Chalmers University
of Technology
Member of the
Mistra Future Fashion Board

"I sense a curiosity among participants about each others' projects"

"I rank Mistra Future Fashion as my most enjoyable assignment – and I sit on many boards!

What is so smart about this research program is that it has tremendous breadth. We deal with raw materials in the form of old clothes, the chemical dissolution of textiles, spinning thread, consumer behavior, fashion design, politics and social aspects of fashion. Not many research programs are spread across the value chain in this way. The science in Mistra Future Fashion is, in other words, very cross-disciplinary!

In many other cross-disciplinary research programs, you work individually, and then meet once every six months to talk about what you have done. In Mistra Future Fashion we don't work like that – I have never participated in a project where people are so willing to work together.

Of course, it isn't always that easy to understand each other – when the chemists talk about chemistry, the consumer behaviorists can't keep up, and when the fashion designers talk about fashion, the chemists are lost... but we have many meetings, and at the board meetings we always have seminars. Moreover, all the project members actually attend the meetings, and listen and learn about each other's areas. I sense a curiosity among participants about each others' projects and a great willingness to cooperate. It is important for people involved in subprojects to realize they depend on each other – because they simply can't do their work in isolation.

The advantage of having cross-disciplinary cooperation that works is that it is so much easier to see how individual efforts benefit the whole – when the chemists who develop processes that dissolve old jeans can see a celebrity wear recycled clothes on the red carpet, then everyone can appreciate the cooperation and see the result.

It is also easy for others to relate to the program's research. Clothes and fashion affect most people and are easy to discuss with anyone. The project's timeline is over the short term – in perhaps as little as five years the first clothes might be out on the market. This, in turn, helps companies see the benefits of being involved in the research. Deep and theoretical research programs usually produce benefits that are evident in maybe twenty years. Mistra Future Fashion, however, is a broad program that is very hands-on with opportunities to influence outcomes right away. This is evident among the companies that are involved in the program; the cooperation seems to rank high on their agendas."



Eva Bohman
Head of Textile Division
Textilia AB
Upcoming industry partner
in MiFuFa 2013

"being involved in Mistra Future Fashion gives me an opportunity to make a difference"

"Textilia came in contact with Mistra Future Fashion when they searched for the company responsible for the Stockholm County Council (Stockholms läns landsting) textiles. Since Textilia handles all their textiles, from sheets and towels to patient and staff clothing, we became involved with the sub-project 'Fashion for the public sector'. At one of our first meetings, I showed Mikael Lindström and Annika Lindström Textilia's laundry in Rimbo, which is not exactly a small washtub – it is an industry! Right there our discussions had a starting point about how we wanted to work together.

Participating in a scientific project as a company obviously requires some extra work. However, you get a lot back. Firstly, the research area is interesting, and secondly, it gives Textilia an opportunity to make a difference – if you aren't involved, you don't even have the opportunity to express your views. Often you are quickly forced to accept the changes that are introduced, without being able to plan ahead.

Since I participate in the Swedish Standards Institute's working group for the development of standards for medical textiles, I have always been interested in the development of our textiles. The County Council occasionally sends proposals about organic cotton. I think this is excellent, but the problem is that we use mixed fabric made out of polyester/cotton because it is a durable fabric that also looks smooth without a lot of work. It is important that the fabric looks smooth since no one wants wrinkled garments – and not many people want to pay the extra cost involved in pressing cotton garments.

Unfortunately, it is difficult to obtain organic fabrics with a polyester/cotton mix, partly because they are difficult to produce, but also because there isn't market demand for either recycled polyester or polyester that meets environmental requirements. Furthermore, it is unclear whether it is possible to make recycled polyester fiber white, which is the color that dominates textiles in health care. I see it as a problem that the only Ecolabeled material available is 100% organic cotton – because then you can't fulfill the Swan label requirements for the laundries, which call for low energy and water consumption. As I see it, organic cotton therefore might not be the best option for the environment, regardless of its Ecolabel.

It seems important to highlight this problem for further research, and being involved in Mistra Future Fashion gives me an opportunity to make a difference."



Rebecca Earley
TED, University of the Arts
London

Project leader p3 “inter-
connected design thinking
and processes for sustain-
able textiles and fashion”

Interview in conversation
with Kay Politowicz and
Miriam Ribul

“in Mistra Future Fashion, we need to work with the consumer”

“Outreach is right at the heart of the Mistra Future Fashion project ‘interconnected design thinking and processes for sustainable textiles and fashion’ – a project designed to provide platforms and tools to communicate both within and outside of the Mistra Future Fashion program. At the moment, we use the website textiletoolbox.com as a platform for building the community – including academic and industry partners – in order to encourage discourse around our project. This platform is designed to evolve in accordance with the project deliverables. Once we have compiled the first body of texts, they will be published as a report in hardcopy and sent to the Swedish fashion industry and beyond. Then Textile Toolbox will serve as an exhibition space for the next year. Thereafter, the website will become more of an interactive space. We are not yet sure what will happen with the platform in the second phase of the project it – we might keep it as it is, or we will do something completely different with it!

As fashion designers, we are used to having a visual end product – often a catwalk show. In Mistra Future Fashion, we need to work with the consumer. The design researchers need to look and talk like fashion experts. The end product that we have in mind right now is a collaborative presentation, where all projects will contribute in several ways towards a visual experience for the consumer, for other academics and for industry. If we communicated the work of Mistra Future Fashion through visual proposals we would promote all of the projects and show that it isn’t just about fashion or science – it’s both and beyond.

We think it is really important to realize that you shouldn’t try to tackle sustainability on your own. As design researchers in an academic community, we took that message onboard in TED (Textile Environment Design) fifteen years ago. From the outset, we established a group instead of promoting individual academic researchers. In the MiFuFa project we’re expanding that openness, across disciplines, because we believe that we need lots of different players to meet the challenge of sustainability issues.”



program interaction

recycling textile



Mistra Future Fashion puts focus on a transformation towards a sustainable fashion industry by following the whole value chain.

With Sweden as a platform for research, Mistra Future Fashion (MiFuFa) covers the garment lifecycle from fiber production, through designer and retailer, to the customer and the consumer phase, and further on to the used and worn textiles phase.

Huge material gains can be made by recycling textile fibers and not just reselling or reusing garments that the first user no longer wears. Sweden has traditionally lacked options for recycling textiles other than reuse initiatives from voluntary organizations, such as the MiFuFa partner Myrorna, which accepts donations of clothes mainly for second-hand retail. In other parts of Europe, the commercial textile sorting industry is more active. SOEX and KICI are the main actors; they have developed the industry of mechanically sorting textiles based on the quality of garments and textile materials.

The second-hand market is, of course, the most environmentally benign forum for handling used textiles, but it discards worn and ruined clothes that can easily be reused as raw material for up-cycled products, strong composite materials, or new synthetic textile fibers. The MiFuFa partner SOEX has a zero-waste goal for the textiles industry, stating that all textiles and textile fibers shall be reused/recycled. Within MiFuFa, p1 "changing markets & business models: towards sustainable innovation in the fashion industry" is reviewing options for recycling and take-back systems as part of potential new business models for sustainable fashion.

WEEKDAY/I:Co collaboration engages many MiFuFa projects

To reach the goal of a sustainable fashion the proactive consumers is a key player in all behavior phases of consumption; from conscious buying, to use and handling of the garments in the user-phase as well as giving the garment an after-life.

In October 2012, WEEKDAY began a collaboration with I:Collect (I:Co) to take care of used garments and textiles. Recycling bins were placed in WEEKDAY stores in Gothenburg, Stockholm, Uppsala, and Malmö. The bins were then sent to the SOEX sorting plant in Germany where the donated clothes are sorted into categories of re-wear, re-use, and re-cycle. The MiFuFa program monitored the startup of this textile collection initiative. The program studied the initiative from several perspectives and angles involving a number of research projects in the MiFuFa program such as p7 "sustainable consumption behavior" and p5 "reuse, recycle and end of life issues". This gave us an opportunity to monitor and improve potential methods of recycling textiles in Sweden.

To track changes in consumer behavior and awareness of fashion consumption, p7 conducted surveys both prior to and after the in-store collection. The conclusion from this pioneer study was that the in-store recycling programs most effectively reached and involved consumers who were already aware and active. This has implications in how the recycling initiatives could be improved from a marketing and communication perspective to convince a larger group of consumers to use in-store recycling systems.

From a recycling and material use perspective, the collected clothes were sent to SOEX for sorting. The discarded textiles were then disintegrated and sent for analysis and characterization at Chalmers and Swerea IVF. These institutions have conducted research on how used cotton and polyester can be recycled into synthetic textile fiber. Their challenge is to find the best way to separate fiber mixes, such as cotton and polyester blends, which are common in clothes.

The business model project p1 "changing markets & business models: towards sustainable innovation in the fashion industry", is connected to this initiative through its analysis of the potential of sustainable recycling business models for the fashion industry. Furthermore, p5 will evaluate various textile recycling programs run by MiFuFa partners. Life Cycle Assessments (LCAs) indicate that the greatest environmental impact of a T-shirt is caused by intense washing and tumble drying by the consumer. P2 "clarifying sustainable fashion" and p4 "interconnected design thinking and processes for sustainable textiles and fashion" are developing methods on how to improve washing behavior.



At SOEX' sorting plant in Wolfen, Germany

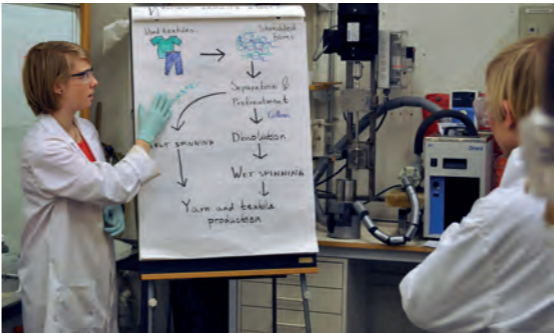


Glimpse of the workshop in London in June

scientists meet designers

On June 18-19 2012, p3 based at Chelsea College of Art & Design, TFRC, London, hosted researchers from MiFuFa and other institutions for a 24-hour cross-disciplinary event.

Talks and events focused on the insight gained through collaboration between scientists and designers, which is a key benefit for the MiFuFa program. One workshop allowed participants to play the roles of sustainable fashion consumers, designers and industry advisors. New TED's TEN workbooks were tested and participants were asked for suggestions on how to achieve systemic change in the fashion industry.



annual program meeting

On December 4-5 2012, Chalmers and p5 "reuse, recycling and end of life issues" hosted the second annual meeting of MiFuFa at Chalmers University of Technology in Gothenburg.

On the first day researchers, board members and partners were invited to project presentations followed by productive panel discussions. Researchers had an opportunity to interact on the second day at the following three workshops: KPI (Key Performance Indicator); Textile Fiber; and Wardrobe Surgery.

PhD blog

In the spirit of cross-disciplinary collaboration that defines the MiFuFa program, young researchers and PhD's have come together to create a blog. The blog is meant to be a place for PhD students to share research, ideas and events. A blog provides a great format where complex research topics can be deconstructed in an understandable and relevant manner. The blog currently has eight writers but, in the spirit of collaboration and motivation, more are welcome. As momentum grows, the blog can become a vehicle for sharing information about the great work carried out by the MiFuFa program. This will allow interested parties to promote a sustainable fashion future. www.futurefashionresearch.com



The blog:
www.futurefashionresearch.com

policies for sustainable fashion

On November 15 2012, p8 held a workshop at the Stockholm School of Economics in cooperation with the Swedish Environment Protection Agency (Naturvårdsverket) and the Swedish Chemicals Agency (Kemikalieinspektionen). The workshop's objective was to discuss and compile policy recommendations from key actors who influence sustainability in the fashion industry. Representatives of government (ministry and agencies) and the the fashion industry (companies and industry associations) as well as consumers participated in the workshop.

The event generated an intriguing list of policy recommendations including: more stringent legislation for managing textile waste, policy support for prolonging the life of clothes, and a push for an EU textile directive that focuses on the whole life cycle.



(upper) The Copenhagen NICE Fashion Summit Runway Show
(lower) MiFuFa seminar in Copenhagen

integrating social and environmental issues of fashion

On May 2-3, 2012, Copenhagen Business School (CBS) hosted an international symposium on sustainable fashion. The focus of the symposium was on the opportunities for and barriers to integrating social and environmental issues into different stages of the fashion lifecycle – from design to final disposal and reuse.

On May 2nd, researchers and practitioners from Denmark and abroad discussed the potential for mainstreaming sustainability in the fashion industry.



Meeting at the Copenhagen Opera House



project
progress



changing markets & business models: towards sustainable innovation in the fashion industry (p 1)

Identifies what is needed to stimulate more innovation, including the development of more sustainable business models for Swedish fashion companies.

Project leader:
Esben Pedersen, Copenhagen Business School, CSR Center

Other participants:
Susanne Sweet, Stockholm School of Economics
Anne Roepstorff, CBS CSR Center
Kim Sundtoft Hald, CBS Department of Operations Management, PhD student, CBS CSR Center
Peder Pruznan-Jørgensen, BSR Europe
Lars Stigsson, Kiram AB



In 2012, project 1 began an in-depth analysis of new market and business models for sustainable fashion. In particular, the year was devoted to collecting qualitative and quantitative data from the fashion industry. The project is currently analyzing the data and writing several articles intended for publication based on the results.

Sustainability not very high on the agenda for fashion managers

The project performed an online survey among 492 Swedish fashion companies during the year. The survey was designed by CBS and GfK carried out the data collection. The results indicate that sustainability is not very high on the agenda when fashion managers are asked to list factors that are key to future competitiveness. Focus remains on traditional business priorities like marketing, customer relations, etc. The results also indicate that fashion companies are not entirely convinced about the business case for sustainability, which in turn places some limitations on the expected growth rates of voluntary sustainability efforts.

Interviews with fashion companies

The project also carried out a large number of interviews with fashion companies and other relevant stakeholders. The interviews will be used as input for a qualitative analysis of sustainability implementation, as well as background information to gain a better understanding of the Swedish fashion industry. The purpose and character of the dialogue differed significantly. For instance, some of the interviews carried out in 2012 are used directly for research purposes, while others serve as inspiration for developing new research questions – and still others provide an overview of the clothing and textile industry regarding sustainability. To cite a concrete example, the interview with Lånegarderoben (“The lending wardrobe”) inspired the development of an actual study of collaborative consumption, whereas the interview with Filippa K will be used for a research paper.

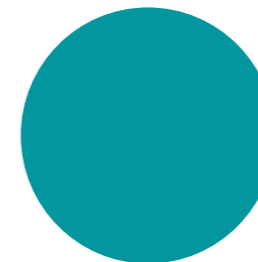


clarifying sustainable fashion (p 2)

Aims to improve sustainability assessment methods that are relevant to the industry, including Life Cycle Assessment (LCA), and to improve tools for environmental labeling and design of garments.

Project leader:
Gregory Peters, Chalmers University of Technology CES Team

Other participants:
Magdalena Svanström, Chalmers University of Technology
Bahareh Zamani, PhD student, CES, Chalmers
Wencke Gwozdz, Copenhagen Business School
Tom Nilsson, Malmö University
Anna Karin Jönbrink, Swerea IVF
Stefan Posner, Swerea IVF
Gustav Sandin, PhD student, SP/Chalmers CES
Sandra Roos, PhD student, Swerea IVF/Chalmers CES
Cathrine Löfgren, Sustainability group, Innventia



During 2012, one focus of project 2 was life cycle inventory data. Publicly available life cycle data was assessed and the project has participated in case studies involving the acquisition of new chemical usage and other life cycle inventory data for specific textiles. It has become evident that the tools available for the assessment of textiles are rather qualitative in regards to chemical issues, largely due to the lack of inventory data. Two relatively new fibers considered in the case studies are eucalyptus and bamboo based cellulosic fibers. Part of this data will be made public in 2013 (in collaboration with project 4 “moving towards eco-efficient textile materials and processes”).

Examination of emerging methodologies for assessment of biodiversity

A preliminary assessment of European forest cellulosic fiber production was conducted in 2012. This is part of an effort to examine emerging methodologies for setting values for biodiversity and water use impact associated with the use of fibers of this type.

It is imperative that sustainability assessment considers the main impacts of whatever product or process it examines. Biodiversity and water have historically been overlooked, considered too difficult to assess, or even viewed as irrelevant (in Europe). However, these are key issues for non-petrochemical fiber production in other parts of the world. Still, with recent improvements in methodologies for biodiversity and water use assessment, and the globalization of the fiber trade, assessment of both these environmental criteria is feasible and increasingly critical to defining the sustainability of forest-based cellulosic fiber. An article proposing modifications to current approaches was accepted after peer review by a leading scientific journal.

The potential of reuse and recycle of textile material

In addition, a “cornerstone analysis” of end of life of garments was produced. The analysis includes current and potential textile recycling options based in Sweden, to generate further policy discussion. The analysis indicates that moving beyond the current level of energy recovery from textile waste towards increased reuse and recycling of textile material has significant potential benefits. Results of this analysis were submitted for peer review and publication in a leading scientific journal.



interconnected design thinking and processes for sustainable textiles and fashion (p 3)

How can we rethink design processes so that companies prioritize more sustainable choices? Project 3 aims to improve company design and product development processes to make available products and services with significantly better environmental performance.

Project leader:
Rebecca Earley,
University of the Arts London,
TED department

TED core team:
Kay Politowicz
Clara Vuletic, PhD Student
Miriam Ribul, Research Assistant
Ana Diaz, Intern

Other participants:
Faculty at TED and TFRC
& Konstfack, Stockholm

2012 was an exciting and highly productive year for project 3. The team met all its goals and objectives for the year, and generated many new methods and ideas for action.

Project 3's first milestone was the website textiletoolbox.com. By designing, building and attracting an audience to the website, the project created a forum for academics, designers, and industry experts to contribute to the research. The site is used to facilitate discourse around TED's TEN - a set of sustainable design strategies that will drive innovative action and concepts for the Swedish fashion industry. The content focuses on inspirational projects and the challenges the industry faces in shifting towards systemic industry change. At the end of the posting process, the project will have thirteen essays and 39 potential case studies to use for the next research stage. The site was reviewed by the participating writers and their associates. Project 3 now has the means to develop the toolbox, communicate with the stakeholder network, and help it grow.

Development of research methods and the elective program

The project also developed research methods and introduced new ones. Its focus was on new workshop techniques, communication skills and active research approaches. The elective program at Konstfack was successfully developed, tested and launched last year. The program was initially tested with Chelsea MA students, and then adapted to fit the needs of students and staff at Konstfack.

A wide range of interaction

Dissemination of design ideas is a cornerstone for project 3 and the team continues to be very visible and present within the field of international sustainable fashion and textiles. In 2012, project members presented the project ten times in five countries. Developments relating to the project were also presented in four online articles and twelve blog posts. The project team's filmmaking endeavors enabled the project to reach a wider audience and will continue to be an important part of the dissemination plan. The films are available at textiletoolbox.com.



www.textiletoolbox.com

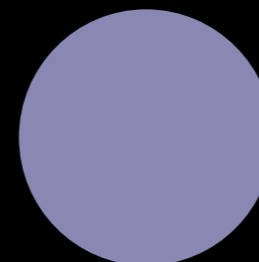


moving towards eco-efficient textile materials and processes (p 4)

Aims to find solutions for moving towards eco-efficient textile materials and processes. To achieve this, new fibers and spinning processes must be developed as alternatives to cotton, which has reached its peak in respect of production quantities. The project also includes the development of dying and washing processes with reduced environmental impact

Project leader:
Desiré Rex, Swerea IVF

Other participants:
Bengt Hagström, Swerea IVF
Sandra Roos, Swerea IVF/Chalmers CES, PhD student
Anna Karin Jönbrink, Swerea IVF
Anne-Charlotte Hanning, Swerea IVF
Gregory Peters, Chalmers University of Technology, CES
Hjalmar Granberg, Innventia



In 2012, project 4 collected data and compared various tools for assessing sustainability. Data collection included a literature study and two case studies; one that required a study trip to China. The other case study was initiated by TvNo Textile service AB, which also joined the Mistra Future Fashion consortium. The life cycle assessment of a nurse uniform, produced from eucalyptus fibers, contributed both as the background information that TvNo needed to make an informed decision to purchase the uniform, but also to a scientific conference contribution to the LCM conference in 2013. The literature study indicated that a large data gap exists in regards to quantitative chemicals data. Most assessment tools are environmental management tools; they pose questions about chemical restriction lists rather than hazardous chemicals in products and processes.

Development of support tools for evaluating sustainability in project 4 hinges on developments in the fashion industry, especially the Higg index. However, they also rely on developments from the environmental research community, mainly the chemical footprint and USEtox. During 2012, networking among these three initiatives was promoted to initiate collaboration. They are considered crucial to the project.

Twisting of yarn

The focus in 2012 was on learning about twisting yarns and blends. Twist affects the arrangement of fibers or filaments in the yarn's cross section. The twist also affects the hairiness of yarns, which determines the pilling behavior and the economics of the singeing process. Results from the different trials indicate that the CelluNova fiber has poor wet strength due to high moisture regain. The most desired characteristic of CelluNova is its tensile properties, which were improved by twisting.

Untwisted CelluNova has poor dry strength compared to cotton, lyocell or PES. By twisting CelluNova, the dry strength increased substantially. The highest value was achieved with single CelluNova yarn with a PES covering. This result is comparable to the dry strength of cotton yarns. Due to the limited quantity of CelluNova fiber, not all the tests could be completed. During 2013, work will continue with the yarn twisting equipment, and more trials will be performed in twisting and evaluating the properties of CelluNova as well as other materials, for example, milk fiber (Qmilch®) and viscose from bamboo.



reuse, recycling and end of life issues (p 5)

Develops methods for collecting, handling, up-cycling and up-grading recycled textiles, giving them a new life. The project has two main objectives: to perform chemical research in the area of recycling textile fibers and to develop efficient recycling routines in stores.

Project Leader:
Harald Brelid, FPCE, Chalmers University of Technology
Maryam Mahmoudkhani, FPCE, Chalmers University of Technology

Other participants:
Anna Palme, FPCE, Chalmers University of Technology
Bengt Hagström, Swerea IVF
Zengwei Guo, Swerea IVF
Åsa Östlund, SP Technical Research Institute of Sweden
Erik Perzon, Swerea IVF
Christoph von Hahn, I:Co/SOEX
Nina Gunnarsson, I:Co
Irene Häglund, Fabric Retail Global
Emma Enebø, Myrorna (Salvation Army Second Hand)

In 2012, project 5 initiated its first pilot study, focusing on the distribution of I:Co's recycling bins for used clothes to Weekday stores in Stockholm, Gothenburg and Uppsala. Collection of used clothes in the stores began in fall 2012. The bins are then sent to SOEX and the donated clothes are sorted according to SOEX's sorting criteria. The next step is to analyze cotton-rich and polyester-rich samples taken from the sorted, disintegrated clothes. The tests will be performed at Chalmers University of Technology and Swerea IVF, according to characterization methods identified for polyester and cotton.

To develop appropriate methods for characterizing cotton-rich as well as polyester-rich material, the project studied a pure cotton textile (cotton sheets provided by Textilia) and a pure polyester material (provided by SOEX) as reference materials. The outcome of the cotton study will be published in a peer-reviewed article. These results will be of use in developing methods for recycling worn textiles so they become virgin textile fibers.

Effects of washing cotton sheets

One important task for project 5 is to purify cellulose from cotton, with a treatment that enables it to be used as raw material to produce regenerated cellulose fibers intended for new use in textiles. The effect of washing cotton sheets with a defined number of washing cycles, was studied during fall 2012. The results were presented by Anna Palme at the annual meeting and will be presented at the *17th International Symposium on Wood, Fibre and Pulping Chemistry* in Victoria, Canada in June 2013.



fashion for the public sector (p 6)

Develops and designs sustainable, comfortable clothing solutions for the public health care sector in Sweden.

Project Leader:
Annika Lindström, Innventia

Other participants:
Mikael Lindström, Innventia/Konstfack

One of the research questions in project 6 is whether design and material choice in patient clothing can affect how a patient responds to medical treatment, and thereby shorten the hospitalization time. During 2012, project 6 planned the experimental design of a tactile study to investigate this. The study aims to reveal the underlying factors people use when judging textile comfort/reporting preferences. Participants in the study will be asked to sort textile samples into groups based on their perceived similarity, so that each group has a property in common that differentiates it from all other groups. A comfort or preference rating is then assigned to each group, and a cut-off value for usage can be stated. In addition, participants describe the groups using words like silky, comfortable, and so on. The study will be performed in 2013.

Investigation together with Textilia

In 2012, Textilia was invited to be a partner in the Mistra Future Fashion Consortium. Textilia is a laundry and textile service provider that is active in public procurement relating to supply, rental and laundry of textiles, including hospital clothing.

Together with Textilia, Project 6 began investigating user requirements in public procurement of hospital clothes. For example, the Swedish Environmental Management Council has developed criteria intended for procurement of laundry and textile services, i.e. rental and washing of rented textiles or washing of own goods. The purpose of the criteria document is to assist procurement organizations (e.g. hospitals) in selecting relevant environmental requirements for these types of products. The user requirement investigation entails practical analysis of how procurement criteria are used by a larger number of Swedish counties and understanding the environmental trends and challenges of their procurement processes.



sustainable consumption and consumer behavior (p 7)

Identifies strategies and tools that ensure that consumers demand and purchase more sustainable fashion products and services

Project leader:
Wencke Gwozdz, Copenhagen Business School, ICM department

Other participants:
Sarah Netter, Research assistant CBS ICM
Lucia Reisch, CBS ICM, Research assistant TBA
Elisabeth Crone Jensen, Research Assistant CBS TBA
Tom Nilsson, Malmö University
Susanne Sweet, Stockholm School of Economics (SSE)

In 2012, project 7 carried out most of its field work regarding data collection and a number of initial analyses. The project is currently analyzing the data and writing publications based on the results.

Charted fashion consumption behavior

A representative survey of young Swedish consumers was carried out during the year. The survey was designed by CBS, pretested by CBS and SSE, and carried out by GfK Sweden. The total sample size was 1,175 participants, representative in regards to sex, age, region and education for Sweden. The topics concerned fashion consumption behavior (purchase, use and discarding phases), general and fashion specific attitudes, knowledge about sustainability and much more. During 2013, the analyzed data will serve as the basis of a report and scientific publications.

Communication with clothes

Project 7 began collaboration with project 4 and SignTrace regarding the potential of Near Field Communication (NFC) chips to monitor the actual use of clothes (i.e. frequency and duration of wear, details about washing behavior, etc.). The project will especially investigate the chips' potential in combination with smartphone applications (Apps) for nudging consumers towards better sustainability in the use phase. The research plan will be further developed in 2013.



policy instruments (p 8)

Project 8 aims to identify functional policy instruments to help the fashion industry become more sustainable.

Project leader:
Tom Nilsson, Malmö University

Other participants:
Parik Hall, Malmö University
Scott McIver, Malmö University
Esben Pedersen, CBS CSR Centre
Susanne Sweet, SSE
Peder Pruznan-Jørgensen, BSR Europe

During 2012, the project's three key activities were: developing a network, holding a workshop and carrying out a green public procurement study. A central aim for the project was the expansion and development of an appropriate network. Researchers attended conferences and meetings to establish useful contacts and participate in the Swedish Chemical Agency's meetings with industry partners. These activities led to successful recruitment of an engaged group of advisors. The second focus was a workshop held in November in Stockholm. It involved key actors from the industry and dealt with the project's research issues – 'Policy Instruments for Sustainable Fashion'. Our third activity, a study, centered on the ability of the state to enforce or influence green public procurement at local and regional levels.

Procurement study

The study of green public procurement procedures (GPP) for textiles focused on connections between central, regional and local levels, and the ability of the state to enforce or influence green public procurement. The study shows that, in the absence of strong regulation, the key determining factors behind GPP in local organizations seem to be the existence of political support and the organizational setup. The setup should be able to channel political support and create the necessary preconditions for setting environmental requirements. Financial constraints, especially in a highly decentralized context, tend to override environmental ambitions, or at least make them easy to overlook. Decentralization and economic scarcity are affected, however, by two other factors: political salience and the availability of specialist knowledge.

Political leadership is necessary to support green public procurement in a sustained fashion. It would institutionalize the process instead of relying on the ambitions of committed individuals. One approach would be to demand that politicians ensure that existing policies and plans for the public sector are fully implemented. Although much can be done by devoted, local actors, old-fashioned, authoritative and binding decisions by national politicians are probably needed.

It may be possible to develop specific knowledge of particular procurement processes. However, the necessary expertise in green public procurement is often beyond what any local actor can supply. This is why the Swedish Environmental Management Council (SEMCO) criteria have been used as support for successful efforts. However, the criteria should be made mandatory, so everybody follows the same rules. Since the knowledge gap at the individual level is very difficult to fill, binding rules for the country as a whole seem to be a better – and a more just – alternative.



publications

A selection of pending
and submitted MiFuFa publications:

Business Model Innovation And Sustainability Performance (Work in progress). Co-authored by Esben Rahbek Gjerdrum Pedersen, Kerli Kant Hvass, and Wencke Gwozdz.

Explorative Life Cycle Assessment of Textile Recycling Techniques by Zamani, Svanström, Peters and Rydberg. This article was submitted to the prestigious *Journal of Industrial Ecology*.

We Are Disruptive: New Practices for Fashion/Textile Designers in the Supply Chain by Clara Vuletich has been accepted with revision for the EAD Crafting the Future Conference in Gothenburg.

Ageing of Cellulose; Property Changes during Long Time Service of Cotton Textiles by Anna Palme and the co-authors (Alexander Idström and Harald Brelid) will be presented at the *17th International Symposium on Wood, Fibre and Pulping Chemistry* in Vancouver (Canada) in June 2013.

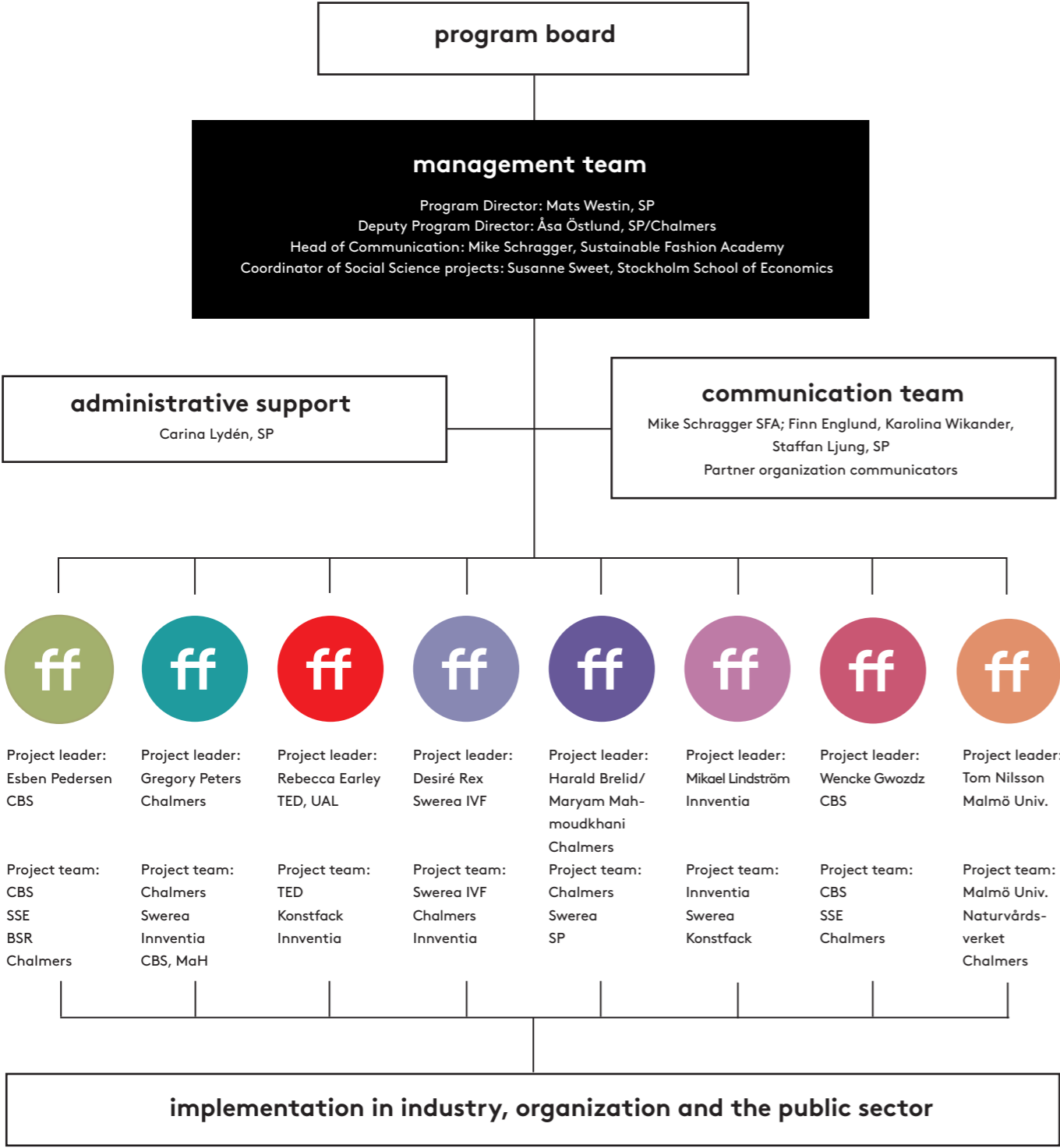
Exit from High Street – A Study of Sustainable Fashion Pioneers Strategies for Ethical Fashion Consumption by Bly, S., Gwozdz, W. & Reisch, L. (2013) was submitted to the *Journal of Consumer Culture*, status: revise & resubmit.

For more information about the program or how your company, government agency, media outlet or civil society organization can get involved, contact:

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team & finance



Program Board:
Four Board meetings were held during 2012

Board Members:
Johan Ward, Hennes & Mauritz AB
Mona Blomdin Persson, Swedish Chemicals Agency
Jonas Eder-Hansen, Danish Fashion Institute
Karin Emilsson, Södra
Ulf Carlson, Chemical and Biotechnical Engineering, Chalmers Univ. of Technology
Nick Morley, Oakdene Hollins
Per-Erik Petersson, SP Technical Research Institute of Sweden
Pernilla Walkenström, Swerea IVF/Adj. Prof. Swedish School of Textiles

Research parties:
SP Technical Research Institute of Sweden
Chalmers University of Technology
Copenhagen Business School (CBS)
Konstfack, University College of Arts, Crafts and Design
Innventia
Malmö University
Stockholm School of Economics (SSE)
Swerea IVF
TED, The University of the Arts London

Industry parties: (contributing in-kind to program activities)
Fabric Retail Global AB
F.O.V. Fabrics AB
H&M Hennes & Mauritz AB
I:Collect AG
Kiram AB
Södra Skogsägarna

Organization and agency parties: (contributing in-kind to program activities)
Swedish Environmental Protection Agency
Myrorna (Swedish Salvation Army 2nd hand)
Protekstiftelsen
Swedish Chemicals Agency

Communication and outreach party:
Sustainable Fashion Academy

Program funding 2012 (kSEK)

Cash funding from:		
Mistra	9 834 877	
Södra's Research Foundation	300 000	
Vinnova	804 275	
University funds	745 279	*
RISE (Institutes)	1 636 930	
Direct contribution from industry	236 549	**
In-Kind from Industry & Organizations	3 817 663	
TOTAL	17 375 573	

Program cost 2012 (kSEK)

Project 1	1 406 517
Project 2	2 107 267
Project 3	1 923 366
Project 4	1 335 764
Project 5	2 038 578
Project 6	333 470
Project 7	1 681 481
Project 8	1 016 781
Program Management	1 297 493
SFA Communication	315 000
Strategic reserve fund (not spent)	339 233
In-Kind from Industry & Organizations	3 817 663
TOTAL	17 612 614

* Excluding costs covered by Copenhagen Business School (approx 100 kSEK)

** Contribution from H&M, TvNo Textilservice, Wiges and the Swedish Chemicals Group