

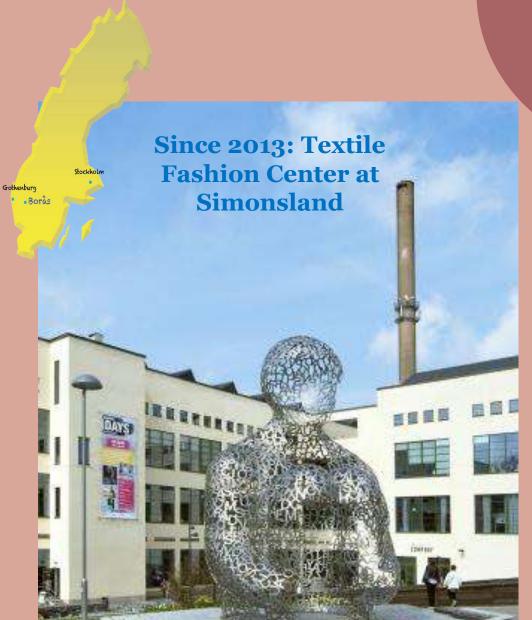
THE SWEDISH SCHOOL OF TEXTILES

UNIVERSITY OF BORÅS



Content

- ☐ General overview
- ☐ Labs facilities
- ☐ Innovation environment & platforms
- ☐ Business & Management research in Fashion-Tech
- ☐ Business & Management education in Fashion-Tech
- ☐ Business & Management students' projects in Fashion-Tech
- ☐ Future ambitions in Fashion-Tech Management

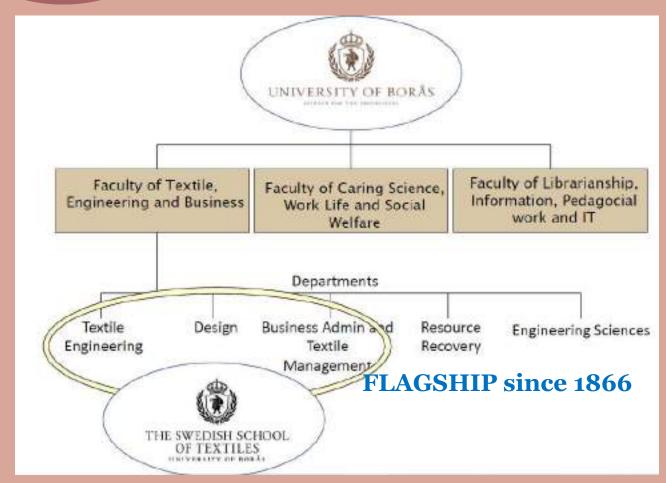




https://www.youtube.com/watch?v=6Bht2m4-FoAhttps://youtu.be/w3cxx4fVRc0

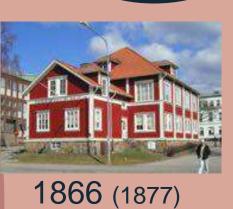
Web: https://www.hb.se/en/the-swedish-school-of-textiles/







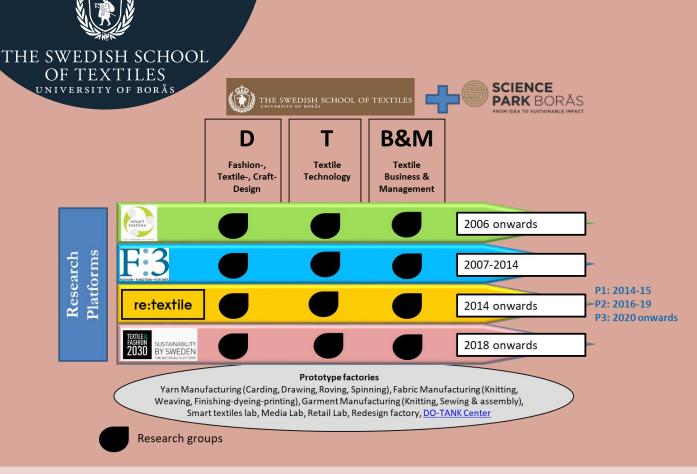
The Swedish
School of
Textiles:
History







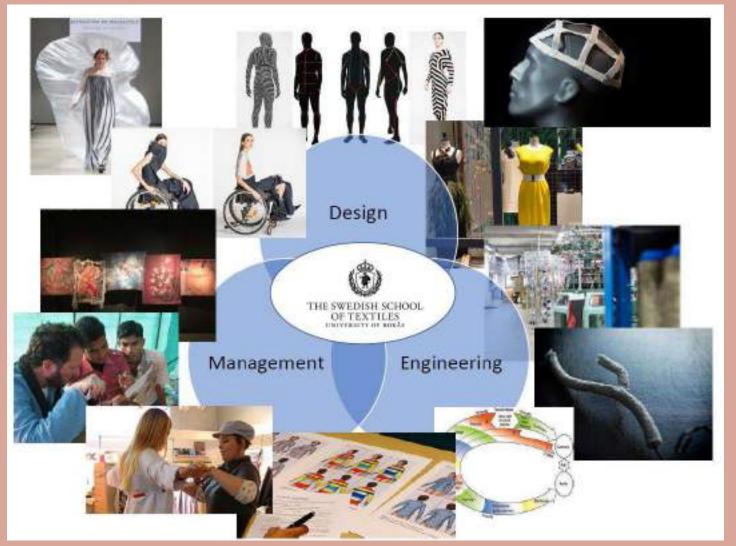
The Swedish
School of
Textiles:
Stats and structure



- About 1500 students
- ☐ 700 programme students
- ☐ 7 undergraduate programs
- ☐ 6 master programs
- 3 Ph.D. programs Textile and Fashion design, management and material technology
- Complete prototype factory laboratories and workshops for textile and fashion value chain



The Swedish
School of
Textiles:
Fashion-tech
research





The Labs as prototype factories

- O Weaving lab
- > Knitting lab
- Sewing lab

- o Dyeing and Printing lab
- o Finishing lab
- O Digital media lab
- ☐ At the Swedish School of Textiles creativity and theory are combined with practical work in our machine parks and laboratories.
- ☐ Our labs offer the unique state-of-art opportunity to work with the entire value chain.

Video: https://youtu.be/osSyqngiA2w

Weaving technology lab



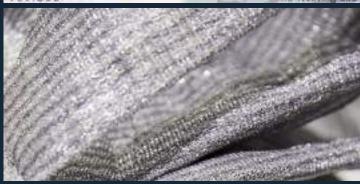
In the weaving technology lab, there are several design and patterning options, such as mechanical and electronic jacquard and dobby. Here there is opportunity to weave with virtually all yarns on the market, from cotton to optical fibres.

- Weaving technology lab: https://youtu.be/SrQL_XbtC2Y
- o **360° view:** https://youtu.be/KXEIeGarX48











Knitwear lab

In the knitwear lab, fabrics are made on circular knitting machines and in the tricot lab you can produce double jersey in large and small patterns, as well as rib, plush and single jersey material in varying sizes. Here you have the opportunity to work with stiff materials, such as metal. There are also hand knitting machines in flat knitting technology to test different constructions, make prototypes of jumpers, gloves, blood vessels and other three-dimensional shapes in both stiff and elastic yarns.

- o **Knitwear lab:** https://youtu.be/s7Wd3uXCT28
- o **360° view:** https://youtu.be/30E_96uR3K4















Sewing lab

In the sewing lab, there is a large variety of machines for seams and other joining techniques. The machines can join together materials such as knitwear, woven, leather, fur and make seams waterproof. This miniature-size sewing factory has all the basic sewing machines and a large number of special machines such as shim presses, ultrasonic welding, tape machines and postbeds for leather.

- o **Sewing lab:** https://youtu.be/RPJe7HUMTMQ
- o **360° view:** https://youtu.be/rG1dYQrHaBk











Dyeing, printing & finishing labs

The lab for colour and print offers endless possibilities to create your own expression. Here is a large range of equipment to be able to work with many different techniques. Instruments and machines include dyeing machines, digital printing machine, printer for sublimation printing etc.

- O **Dyeing and Printing lab:** https://youtu.be/o91qsjFNkps
- o **360° view:** https://youtu.be/0BV3iuj56x0
- o **Finishing lab:** https://youtu.be/julmqxaRShs
- o **360° view:** https://youtu.be/Axi4Z-OSrxw











Digital Media lab

The Media Lab focuses mainly on the process of moving from a digital image (graphic design) to its application on materials via laser cutting or digital sublimation printing. Projects include engraving patterns and motifs to cutting out custom-designed pattern parts, appliqués, or other types of decoration, or cut out standardised samples. Digital printing.

The laser cutter also creates opportunities for prototype production in various research projects.

O **Digital Media lab:** https://www.hb.se/en/the-swedish-school-of-textiles/about-the-swedish-school-of-textiles/the-labs/teko-media-lab/





Research labs

The focus of the research labs is to develop materials of the future in functional and smart textiles, as well as and resource-efficient innovative production processes. Important research areas include development of new textile materials, such as textile sensors, functionalization of textile surfaces through inkjet, valve jet and 3D printing, development of polymeric e-textiles using electronics, textile actuators, fibre ionotronics, microfluidics, 3D body scanning and fitting.













Science Park

Science Park Borås – a unique environment within University of Borås – enables innovations, research and prototype development, and creates opportunities for commercialization of products and services with textile and fashion through synergies between higher education, business and the municipality. It offers an innovation ecosystem through several platforms and establishments.





Science Park located at Textile Fashion Centre, Borås



3 main environments



Do Tank Center



Smart Textiles Showroom



Exposé Exhibition









Textile&Fashion 2030

The Swedish government mandated National platform for Sustainable Fashion and Textiles, delegated to University of Borås. ts aims are:

- ☐ To promote collaboration, cooperation, and efforts towards an environmentally sustainable value chain in the textile sector.
- ☐ To make research and development results available for environmentally sustainable development and provide a bridge between research and practice.
- ☐ To promote sustainable business models and combine environmental benefits with business benefits.
- ☐ To strengthen the work of SMEs to achieve circular flow and environmentally sustainable development.
- ☐ To minimize negative environmental effects from production.

- **Web:** https://textileandfashion2030.se/en/what-is-textile-fashion-2030/
- o Digital Exposé: https://digitalexpose.se/











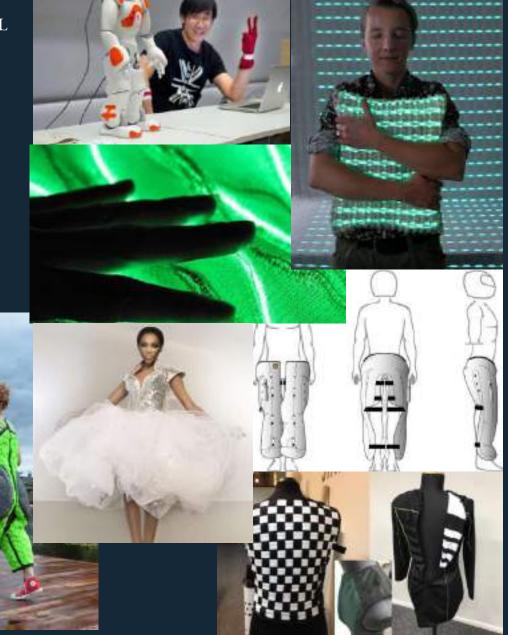
Smart Textiles

Smart Textiles is an innovation environment bringing together the research and business communities, institutions and the public sector to find the solutions of the future. As the Smart Textiles Initiative offers a complete solution including everything from basic research to prototype development, it is the natural partner for realizing textile ideas or meeting a need with textile technology.

- o Web: https://smarttextiles.se/en/
- Smart Textile Showroom: https://youtu.be/ZZANhNz-eoY







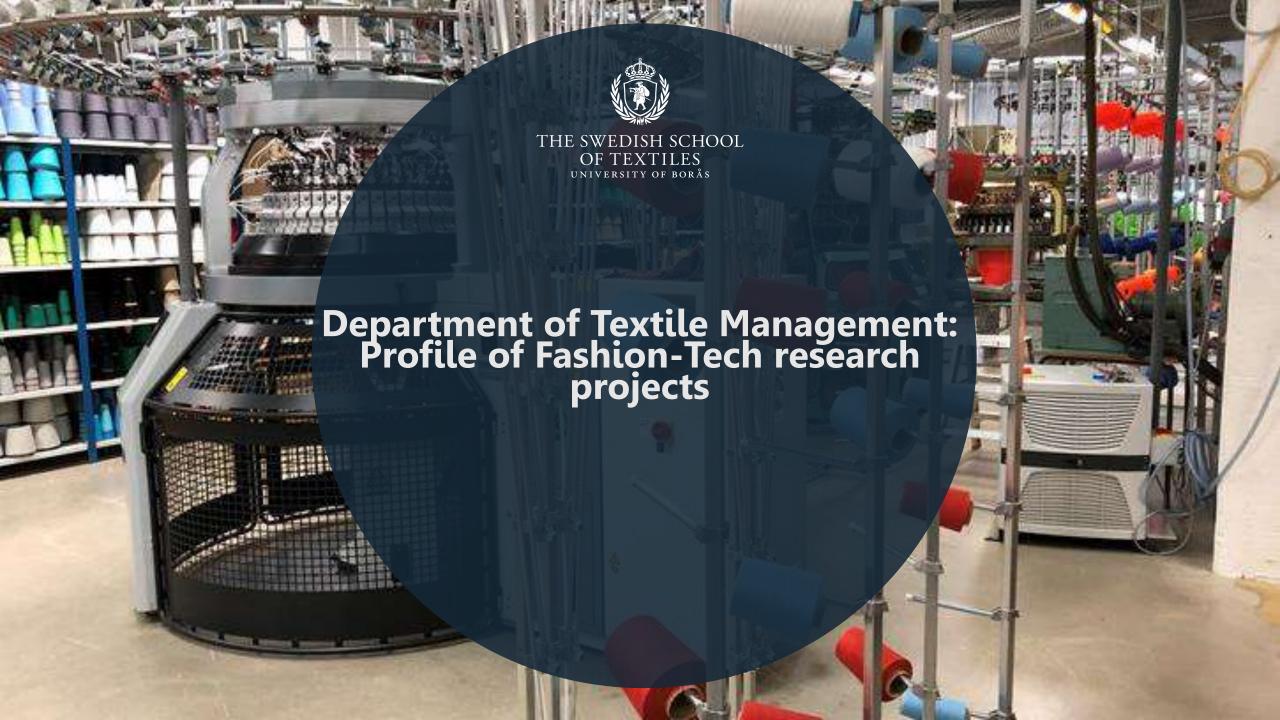
Circular Hub

Cirular Hub is an innovation platform that highlight projects and research environments linked to circular business models, circular products and increased knowledge about circular economy.





Web: https://circularhub.se/





Traceability

System

Demanddriven customized

production

Fashion-

Tech @Textile

Management

Circular

Economy

Fashion-Tech research in the area of Textile Management spans across various projects where business, management, and industrial & textile engineering disciplines form the multidisciplinary foundation for advancing digital innovations in the field of textiles and fashion, by particularly focusing on solving societal challenges related to sustainability.

FBD BModel

Duration: 2017-2021

FBD_BModel is a collaborative project funded by the European Union under the Horizon 2020 Programme which aims to develop a digital platform for delivering small series of innovative functional garments through a European Unionbased textile supply chain model, meeting consumers' personalized requirements in terms of fashion and functional performances.



Project video: https://youtu.be/EMJmm2akbB4

Project website: https://www.fbd-bmodel.eu/



Project leader from HB Prof. R. Pal HB Team Dr. V. Kumar; S. Harper

Demanddriven customized production



Partners:

+ ENSAIT

- + Grado Zero Espace
- + University of Manchester + BeWarrant
- + University of Borås

+ DITF Denkendorf

- + Desap
- + Fitizzy

- + Bivolino
- + Beste
- + Azadora
- + Kuvera Spa

FromRolltoBag

Duration: 2015-2016

FromRolltoBag is a collaborative project funded by the European Union under the Horizon 2020 Programme which aims to connect virtual design and sales technology to digital manufacturing; establish consumer driven production; enable production and delivery of customized orders rapidly; and accelerate the growth of European creative industries.

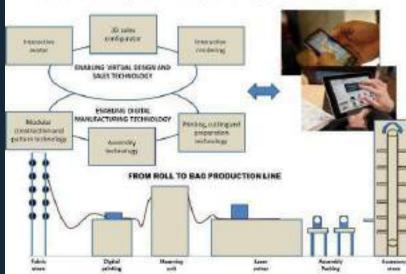


Project video: https://youtu.be/onyZp5foTDg

Project website: http://fromrolltobag.eu/



Dr. J. Larsson; Dr. N. Hernandez; Dr. R. Lindqvist; M. Johansson fromROLLtoBAG Consumer driven local production with the help of virtual design and digital manufacturing 30 rains conference **Telegration**





Project leader from HB

Prof. R. Pal

HB Team







Demanddriven customized production

Partners:

- + Tampere University of Technology
- + University of Borås
- MIRALab
- + Amer Sports

- + Lectra
- + Cyber Lightning
- + Bivolino
- + Alu Group
- + Print Scorpio

DIGIMode

Duration: 2017-2018

DIGIMode is a collaborative project funded by the Swedish Innovation Agency (Vinnova) under the Fashion-tech Programme which aims to develop a demonstrator for virtual design and sales with digitally enabled local production of apparel products that will enhance agility in the customer relation. The demonstrator consists of these 2 parts being connected by a cloud-based system.



Project video: https://youtu.be/r5DyckgU2jk

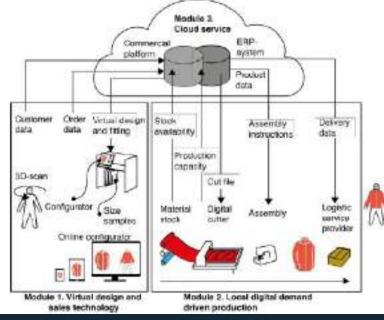
Project website:

https://www.hb.se/en/Research/Research-Portal/Projects/Digimode/



Project leader from HB
Dr. J. Larsson
HB Team
Dr. N. Hernandez; Prof. R. Pal; A.
Vellesalu; S. Harper

Demanddriven customized production









Partners:

- + University of Borås
- + Houdini Sportswear
- + FOV Fabrics
- + Berge Consulting

- + Teko Solutions
- + Marketplace Borås
- + TEKO
- + Syverket Borås

Best-Before

Duration: 2019-2021

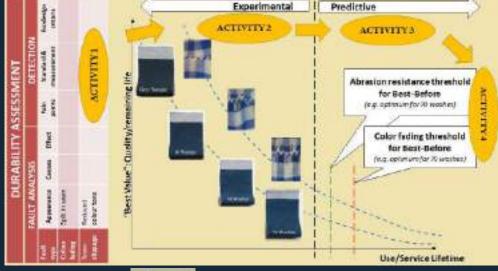
Best-Before is a collaborative project funded by the Swedish Innovation Agency (Vinnova) which aims to develop an Al-based methodology for predictive analysis based on the degradation pattern for different durability properties over time. This will put the optimum best-before date for sustainable longevity in the clothing industry.



Project website: https://www.hb.se/en/Research/Research-Portal/Projects/BEST-BEFORE-Optimizing-clothing-service-life-through-predictive-analytics-for-sustainable-longevity/





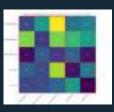




- + University of Borås
- + Fjällräven
- + Berge Consulting
- + Swedish Standards Institute







Project leader from HB

Dr. V. Kumar; Dr. N. Hernandez;

Prof. R. Pal

M.B. Jensen

HB Team

HUGO

Duration: 2018-2020

HUGO is a collaborative project funded by the Swedish Innovation Agency (Vinnova) which aims to adapt the autonomous electric vehicle for circular flows of apparel and fashion products through peer to peer garment sharing and rental services for apparel and fashion products. The system specifically focus on reducing environmental, economical and social costs associated with last mile delivery of fashion and apparel products.



Project video: https://youtu.be/4lyn2OX5qjA

Project website: https://hugodelivery.com/robot-modularity/



THE SWEDISH SCHOOL OF TEXTILES

UNIVERSITY OF BORÅS

Project leader from HB Dr. J. Larsson HB Team Prof. D. Ekwall

Circular Economy



Partners:

- + University of Borås
- + Berge Consulting AB
- + Ericsson

- + Hugo Delivery AB
- + Something Borrowed AB

Trustrace

Duration: 2018-2020

Trustrace is a collaborative project funded by the **Swedish Innovation Agency** Fashion-tech (Vinnova) under the Programme which develops a platform that combines Blockchain based product traceability solutions with circularity modules. The project demonstrates that by leveraging latest blockchain, Al/ML, cryptotagging technologies, we can transform the fashion industry to be more circular, by increasing cooperating among stakeholders in fashion.



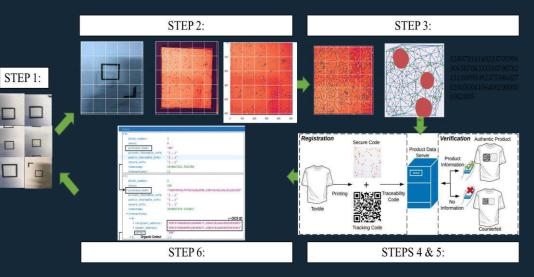
Project video: https://youtu.be/EMJmm2akbB4

Project website: https://www.fbd-bmodel.eu/



Project leader from HB Prof. R. Pal **HB Team** V. Kumar; T.K. Agrawal





Partners:

- + Swin Technologies
- + University of Borås
- + Houdini Sportswear
- + Fillipa K

- + Rudholm Group
- + Mini Rodini

E4FT

Duration: 2017-2020

Education4fashion-Tech collaborative project funded European Union's Erasmus+ program with the aim of bridging the fashion field with that of innovative technologies by creating new training pathway to improve the level of key competencies and skills of students and trainers and to break down barriers between technologists and communities creative and build meaningful collaboration.



Project website: https://www.e4ft.eu/



Project leader from HB
Dr. J. Larsson
HB Team
Prof. D. Ekwall; A. Vellesalu



Partners:

- + University of Borås
- + Politecnico di Milano, Dipartemento di Design
- + University of the Arts, London College of Fashion



Master Programs in Textile Management









Findings from Fashion-Tech research projects are brought into the educational curriculum of Master programs in Textile Management in the form of courses and modules that stress the importance of application of digital technologies to drive innovation in textile value chains and business models for addressing various sustainability challenges.

EXAMPLES OF COURSES COVERING FASHION TECH INSIGHTS:

- ☐ Traceability in Textile Value Chains
- ☐ Textile Applications of Logistics and Product Development
- **□** Demand Forecasting

Bachelor Program in Textile Management

(with specialisation in Fashion and Retail)





BSC program in Textile Management (180hp) aims to develop students knowledge in retail management covering both digital and physical perspectives and tools. It serves as a foundation for master education in textile management at the Swedish School of Textiles.

EXAMPLES OF COURSES COVERING FASHION TECH INSIGHTS:

- ☐ The digital transformation of retail
- ☐ Fashion stores in the future
 - ERP systems and consumer relationship management





2018: Does it really fit?: improve, find and evaluate garment fit







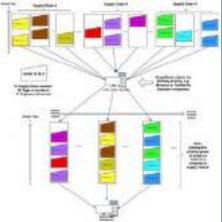
- + Garment fit
- + Pattern construction and modifications
- + Made-to-measure and custom-made
- + Garment simulation

Link: http://urn.kb.se/resolve?urn=urn%3Anbn%3Ase%3Ahb%3Adiva-14321

Author:
N. Hernández
Supervisor:
Prof. H. Mattila

Demanddriven customized production





- + Mass customization
- + Resource sharing
- + Multi-agent simulation
- + Optimization heuristics

Link: http://urn.kb.se/resolve?urn=urn%3Anbn%3Ase%3Ahb%3Adiva-14269

2018:

Inter-Organizational Collaboration for

Optimizing Textile Supply Chains

Author:

K. Ma

Supervisor from HB:

Dr. E. Gustavsson; Prof. R. Pal



2020:

Big Data Management Using Artificial Intelligence in the Apparel Supply Chain: Opportunities and Challenges

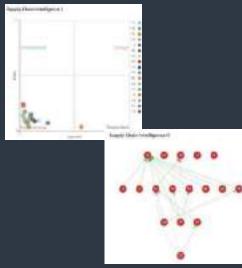


Demanddriven customized production

2020:

Supply network configuration for small series, high-cost production: Exploring the European textile and apparel industry context





- + Big data management
- + Artificial intelligence
- + Personalized offerings
- + Data-driven strategies

Link: http://urn.kb.se/resolve?urn=urn%3Anbn%3Ase%3Ahb%3Adiva-23771

Author:

S. Jain

Supervisor from HB:

Dr. M. Sundström; Dr. J. Petersson

- + Small series production
- + High-cost contexts
- + Supply network configuration

Link: http://urn.kb.se/resolve?urn=urn%3Anbn%3Ase%3Ahb%3Adiva-23206

Author:

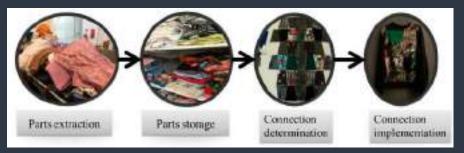
S. Harper

Supervisor:

Prof. R. Pal; Dr. V. Kumar



2018:Reuse-based Reverse Value Chain for Sustainable Apparel Industry





- + Reverse value chain
- + Reuse
- + Value creation
- + Second hand clothing

Link: http://urn.kb.se/resolve?urn=urn%3Anbn%3Ase%3Ahb%3Adiva-15088

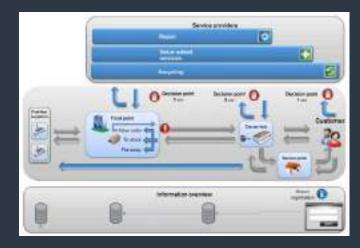
Author: M. K. Paras Supervisor:

Prof. D. Ekwall; Prof. R. Pal

Circular Economy

2013:

On Aligning Returns Management with the Ecommerce Strategy to Increase Effectiveness



- + Returns management
- + Gatekeeping and avoidance
- + Reverse logistics
- + E-commerce

Link: http://urn.kb.se/resolve?urn=urn%3Anbn%3Ase%3Ahb%3Adiva-3648

Author:

K. Hjort

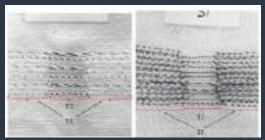
Supervisor from HB:

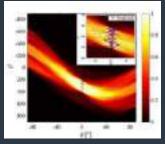
Prof. H. Torstensson

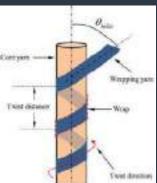


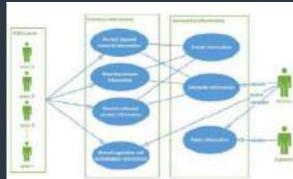
2017:

Exploring fully integrated textile tags and information systems for implementing traceability in textile supply chains









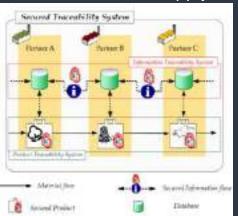
Link: http://urn.kb.se/resolve?urn=urn:nbn:se:hb:diva-12151

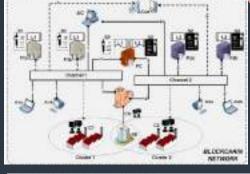
Author:
V. Kumar
Supervisor from HB:
Prof. D. Ekwall

Traceability System

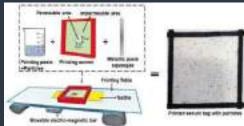
2019:

Contribution to development of a secured traceability system for textile and clothing supply chain









Link: http://urn.kb.se/resolve?urn=urn:nbn:se:hb:diva-15957

Author:

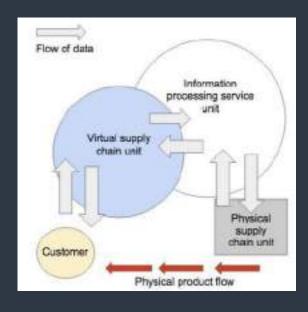
T.K. Agrawal **Supervisor from HB:**

Prof. R. Pal





2018: **Driving fashion with data**



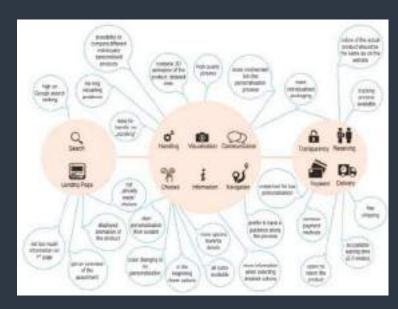
- + Digitization
- + Supply chain configuration

Link: http://urn.kb.se/resolve?urn=urn%3Anbn%3Ase%3Ahb%3Adiva-15745

Author(s): J. Åkers Supervisor: Prof. R. Pal

Demanddriven customized production

2017: **Customer service experience**



- + Service Experience
- + Personalisation
- + Service Value Web

Link: http://urn.kb.se/resolve?urn=urn%3Anbn%3Ase%3Ahb%3Adiva-12725

Author(s):

M. Granic, C. Huss

Supervisor:

Dr. J. Larsson

+ Cloud chain



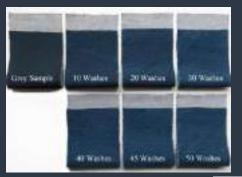
2018: From product to service

2019: Best Before





Circular Economy



- + Product Extension Service
- + Mass customisation
- + Direct to Garment Printing

Link: http://urn.kb.se/resolve?urn=urn%3Anbn%3Ase%3Ahb%3Adiva-15308

Author(s):

S-M. Ertelt, E. Guzun, M. Scott

Supervisor: Dr. J. Larsson



- + Use Optimisation
- + Fabric Degradation





Link: http://urn.kb.se/resolve?urn=urn%3Anbn%3Ase%3Ahb%3Adiva-21941

Author(s):

J. Neuß, M. Schlich

Supervisor:

Dr. V. Kumar



Demanddriven customized production

Selected publications about Fashion-Tech in Textile Management

Circular Economy

Traceability System

- ☐ Jain, S., Kumar, V., 2020, Garment Categorization Using Data Mining Techniques, Symmetry, no 6, article id 984
- □ Pal, R., 2019. Report on data-based services, funded by European Commission, Horizon 2020, Research and Innovation Action under NMBP-22 (Business models and industrial strategies supporting novel supply chains for innovative product-services).
- □ Paras, M.K., Wang, L., Chen, Y., Curteza, A., Pal, R., Ekwall, D., 2018, A Sustainable Application Based on Grouping Genetic Algorithm for Modularized Redesign Model in Apparel Reverse Supply Chain, Sustainability, Vol. 18, No. 3013
- □ Paras, M.K., Pal, R., 2018, Application of Markov Chain for LCA: A study on the clothes 'reuse' in Nordic Countries, The International Journal of Advanced Manufacturing Technology, Vol. 94, No. 1–4, pp 191–201
- □ Agrawal, T.K., Kumar, V., Pal, R., Wang, L., Chen, Y., 2021, Blockchain-based framework for supply chain traceability: A case example of textile and clothing industry, Computers & industrial engineering, article id 107130
- ☐ Agrawal, T.K., Pal, R. 2019, Traceability in Textile and Clothing Supply Chains: Classifying Implementation Factors and Information Sets via Delphi Study, Sustainability, Vol. 11, no 06, article id 1698
- □ Kumar, V., Koehl, L., Zeng, X., Ekwall, D., 2017, Coded yarn based tag for tracking textile supply chain, Journal of manufacturing systems, Vol. 42, p. 124-139



Ambition

HB's ambition is to develop an interdisciplinary collaboration platform that has the role of promoting research and education in the field of digitalisation as the university's core areas.



At Textile Management our future plans in the fashion-tech domain are:

- ✓ Develops fashion-tech R&D projects and training programmes in the areas of:
 - ✓ Demand-driven customized production
 - Circular economy,
 - ✓ Traceability.
- ✓ Create research outputs (innovative methods, models, and artefacts) that can further advance multidisciplinary educational curriculum (e.g. WE-Team) and develop new courses in the field of fashion-tech.
- Enhance opportunities for international collaborations to ensure that graduated students acquire relevant knowledge, skills and attitudes to advance technological innovation, creativity and management in textile industry by means of digitalization.
- ✓ Work collectively to create and communicate new fashion-tech knowledge to various actors in the business and public sector through setting up of specific resource+knowledge base and hands-on tools (e.g. data-services and associated training modules).