



telavalue

Data-driven service concepts

Results from T3.2

Sari Järvinen, Satu-Marja Mäkelä, Hannu Tanner



Summary

In this task, we examined how data from the use phase, particularly the tracking of clothing, is currently utilized in both B2B and B2C environments. We also explored Telavalue's business models of Product as a Service and Take Back, describing how data can be leveraged within these models, as well as identifying barriers and value propositions.

In current B2B environments (a combination of workwear and laundry), tracking clothing is a common practice, typically using RFID technology. The limited scope of these environments facilitates the implementation of necessary technical infrastructure for data collection. However, the current focus of tracking is primarily on optimizing workflow and services for workwear providers and users, rather than supporting garment longevity or sustainability. There is untapped potential to support circularity management, such as optimizing future durability (e.g., washing cycles) and optimizing garment recycling.

In B2C environments, although smart home technologies for automated tracking are available, they are rarely utilized. Manual or app-based self-tracking is more common among fashion enthusiasts. Barriers to implementing clothing tracking in consumer environments include consumer reluctance and infrastructure costs. However, having such information—like usage levels of clothing—could enable new types of services from brands to consumers.

For the Product as a Service business model, the value of data lies in assessing environmental impact and identifying process pain points. However, notable technology investments would be required for data collection if it is not a core aspect of the business. Additionally, extensive data collection, management, and sharing can negatively impact sustainability, and privacy considerations for clothing users must be carefully addressed.

In the Take Back model, brands can engage customers responsibly, gather feedback on product designs, and redirect less-used products with remaining predicted lifecycle to new users. Consumers could identify and resell unused garments, facilitating the secondhand market. Similar to B2C environments, barriers include data collection challenges and sustainability concerns associated with extensive data management and sharing.

When thoughtfully designed, data from the use phase can be a valuable asset for the circular economy. The upcoming Data Protection Regulation (DPP) could further enable the use of data in B2C business practices.



Introduction

- The aim of this work is to identify data-driven opportunities for textile product life-cycle optimization
 - Needs for data collection and sharing of usage data
 - Barriers
 - Data-driven value propositions for sustainable business models (from T3.1)
- We will benchmark different solutions for tracking the product lifecycle
- We will present a selection of data-driven service concepts
- We will identify potential data sources for chosen Telavalue business models to support longer usage of clothing and measuring sustainability

What if it would be possible to collect data throughout the lifecycle? Including the usage phase?



Target: Extending the life of textiles

- EU's ecodesign regulation: garments and home textiles should be used and reused for longer
 - 9 out of 10 Europeans think that clothing should last longer
 - “Prolonging the use of clothes by nine months can reduce their water and carbon-footprint by 20-30%”
 - Increasing the quality of textiles is the most relevant factor for keeping them longer in use
 - Price of repair and access to repair services are seen as barriers
-
- Design requirements: materials, spare parts, ease of disassembly
 - Care instructions: harmonised symbols and rules across the EU
 - Repair information: easier and cheaper repairs



telavalue

Benchmarking

Current solutions for usage phase tracking in B2B and B2C markets



Benchmarking

Benchmarking of existing solutions for tracking textile product lifecycle and especially usage phase:

Review of current solutions (B2B and B2C) using online sources and scientific literature

Interviews of three B2B companies that provide tracking-enabled textile products in Finland

The **objective** of the benchmarking studies was to understand

How textile products are currently tracked in the usage phase

Why the products are tracked

What kind of opportunities have been identified for the utilisation of usage phase data



Tracking of workwear (B2B) – international benchmarking

Practically all commercial solutions apply RFID tags

Inventory management of the workwear stock (provider and user/customer point of view)

- Loss prevention

- Stock and maintenance optimization based on the actual usage

Lifecycle management of workwear, e.g.

- Forecast replacements, and understanding of usage behaviour

- Data from tracking will create visibility to lifecycle

Data-driven processes

- Increasing efficiency, identifying and solving problems in distribution and inventory

Automation of (laundry) processes, detect batches of clothing at once

- Ensuring correct garment care

Improve accountability of providing workwear for users

Circularity management of the workwear

Malinverno, N., Schmutz, M., Nowack, B., & Som, C. (2023). Identifying the needs for a circular workwear textile management—A material flow analysis of workwear textile waste within Swiss Companies. *Resources, Conservation and Recycling*, 189, 106728.

<https://www.rfiddiscovery.com/en/inspiration/7-reasons-track-your-uniforms-rfid>



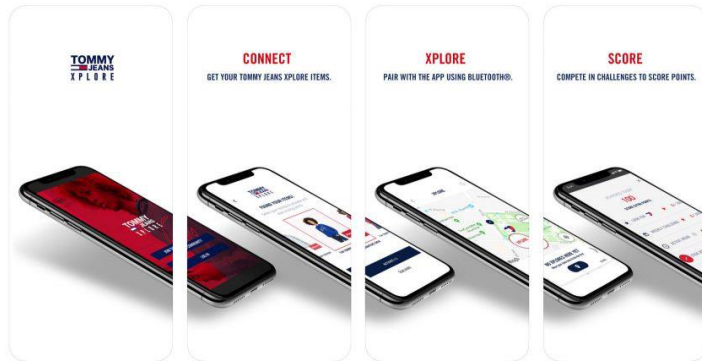
Tracking of consumer clothing (B2C) – international benchmarking

- Smart home technologies for automated tracking are available, yet very rarely used
- Mostly manual or app-aided self-tracking for fashion enthusiasts
- E-textiles for exercise and sports tracking





B2C: Tommy Hilfiger 2018



A new line of smart clothing from Tommy Hilfiger will track and reward users for wearing its products.

The Tommy Jeans Xplore range, which includes T-shirts, sweatshirts and hoodies, is embedded with a smart chip.

Once paired with an app, it will track users and reward them with points that can be converted into merchandise or concert tickets.

The clothing brand hopes it will create a "micro-community of brand ambassadors".

But it will also provide the brand with an unprecedented level of information on customers, said Liron Slonimsky, chief executive of technology partner Awear Solutions.

She **told fashion website WWD**: "Never before has a brand been able to understand how the consumer truly uses the product after it leaves the store."

Track-suits: Tommy Hilfiger's creepy new clothes know how much you wear them

Tommy is watching!

Tommy Hilfiger has launched a ridiculous line of smart clothing that rewards you for wearing it

Here comes more smart clothing nobody asked for. Fashion brand Tommy Hilfiger today announced the launch of a new line of **men's** and **women's** clothing, Tommy Jeans Xplore, which comes with smart-chip embedded technology. Hilfiger's smart clothing aims to reward you with points for wearing Hilfiger clothing. Yes, really.

It's come to this, folks.

Is smart tech hurtling us towards a dystopian fashion future?

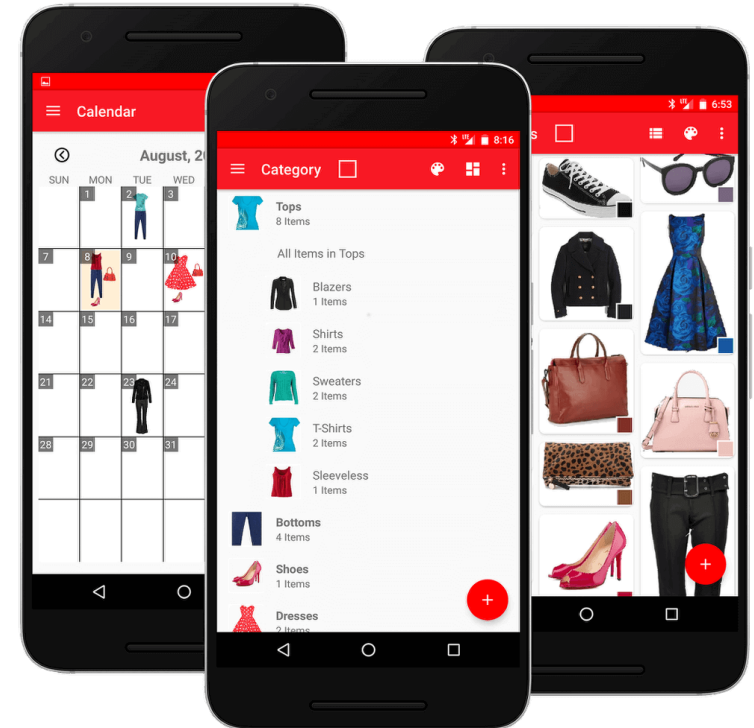
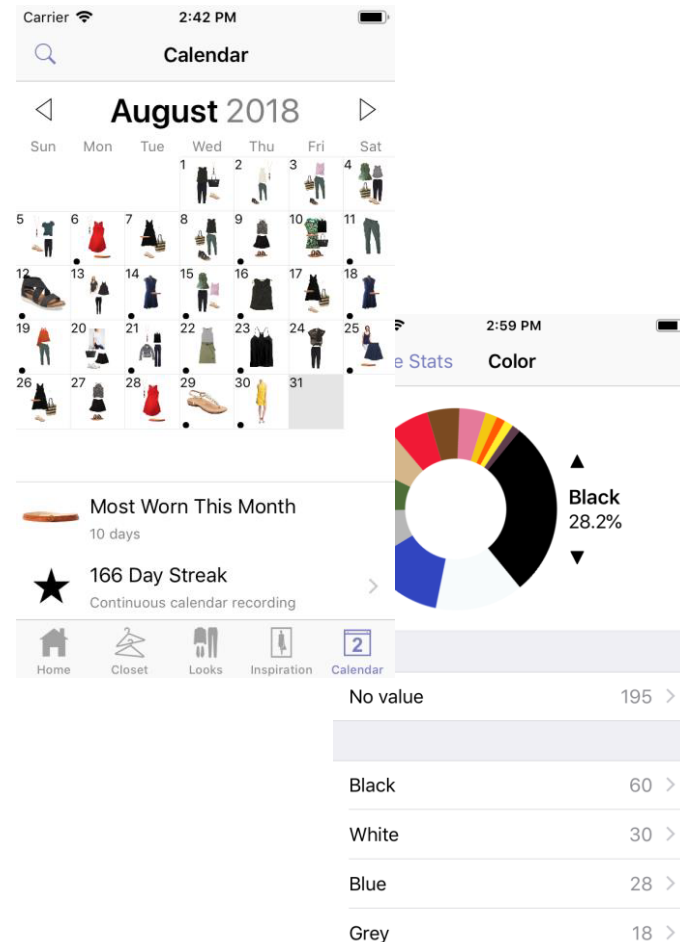
Needless to say, Tommy Hilfiger grabbed a lot of attention last year when it announced the launch of its new Bluetooth-enabled clothing range. Not because of the tech as such, but more the application of it. The XPLORE range tracks your movements and rewards you with points for wearing the products.

This is a tough one. It's easy to argue that the Tommy Jeans XPLORE concept is unnecessary, and possibly intrusive - potentially creepy even - but it also paves the way for a new kind of knowledge.



Wardrobe apps for mobile devices

- Cladwell
- Closet+
- ClosetSpace
- MyDressing
- Smart Closet
- Stylebook
- Stylicious
- WearTracker
- YourCloset
- ...etc.





Insights on Finnish perspective from conducted interviews and visits [1/2]

Textiles are tracked with **RFID tags**

Durable, reliable, and relatively inexpensive solution

Quick operations with several products simultaneously

Control stations/readers located inside provider premises and/or customer premises

Product tracking is mostly used by the textile providers for

Inventory keeping and optimisation

Internal work process management

Assuring the quality of service

...but also to track the product location in customer premises

Results as separate reports or integrated to other IT systems



Insights on Finnish perspective from conducted interviews and visits [2/2]

Usage data was seen to have **strategic value** for the provider:

Knowledge-based management

Customer communication and marketing

All interviewees recognised **unused potential** for usage phase data

Product tracking is currently **not** used

to assess the condition of the garment (except for “reason for deletion”)

to extend the textile lifetime or promote circularity

to support purchasing decisions



Reflection of textile tracking in B2B

Tracking of work wear for laundry services and logistics is widely practiced

Technology is mature and proven in practice, economically feasible

Tracking is simple as the system is predetermined and closed

Customers/user accept tracking because of resulting savings

Current tracking is focused on **optimising the workflow and services** provided to workwear providers and users, not to support prolonging the life or sustainability of the garment

Future plans include tracking of each type of textile for

Useful life estimation/optimization

Durability (washing cycles)

Reasons for discard





Reflection on B2C services

Barriers on the consumer side

Benefits to consumers? Could incentives create interest?

Low level of automation (will DPP change this?)

Privacy and ethics, data ownership, governance

Sustainability of data collection (home, data centers)

Impact of upcoming EU legislation (ESPR, EPR,...)

To maximize the usage of a consumer textile, more impact could be created by improving

The quality of purchased textiles (material, model, design,...)

Access to care instructions

Access to repair services (location, price) and spare parts

Consumer awareness



Potential of tracking consumer clothing

In the future, if/when tracking technology is more accepted and advanced (e.g., embedded to smart home infrastructure, washing machines, wardrobes and to clothing), usage phase data can be utilised by...

...fashion brands, retail and textile service providers

All usage information (what, when, where, how products are used, washed, and stored)

Insight to usage behaviour would most likely be used for increasing sales, but could also lead to re-engineering of products and processes for increased quality and sustainability

...new technology providers

New business models, e.g., for domestic appliance manufacturers as a data provider for fashion industry or for novel sensor technology providers for data gathering

...consumers

Measuring (and managing) and increasing sustainability of purchases and use process, and the lifecycle of garment

Increased awareness of impacts of own consumption choices

New personalized services:

Learns the consumer's preferences, styling services

Facilitates second hand sales (C2C marketplaces, second hand stores or retailers) by identifying unused garments

Repair, maintenance and washing services

...recyclers

Automate the quality estimation of incoming textiles (resell/reuse/recycle)

- Shen, B., Ding, X., Wang, Y., & Ren, S. (2019). RFID-embedded smart washing machine systems in the big data era: Value creation in fashion supply chain. *Fashion supply chain management in Asia: Concepts, models, and cases*, 99-113.
- Järvinen, S., Mäkelä, S. M., Häikiö, J., & Karell, E. (2021). Clothing Circulator: Data to extend the lifetime of garments. In *20th European roundtable on sustainable consumption and production: Production, consumption and resilience in a+ 1, 5° world*. Verlag der Technischen Universität Graz.
- Tihon, L., & Weißmann, L. (2023). Mass-Customised Fashion in a Smart Holistic Wear-Care Business Model. *Engineering Proceedings*, 37(1), 8.



telavalue

Data-driven service concepts



Data-driven service concepts

Chosen Telavalue business models for elaboration (from T3.1):

Product as a Service

Take back

Data needs (conceptual level)

What type of data (and how) could be collected from consumer/employee usage of clothing

What information could lead to longer usage of clothing

Barriers (privacy, data ownership, sustainability of data collection)

Data-driven value propositions for sustainable business models



What to measure during the use stage?

Number of uses

Number of clothes a user has access to

Product age

Fashionability

Care cycles

Wear of garment; known problems in discarded garment conditions

Pilling (55%)

Colour fading (53%)

Fabric breakdown (29%)

Accidental damage (29%)

Loss of dimensional stability (20%)

Logo failure (16%)

Discolouration (15%)

Hole(s) in seams (14%)

Trim failure (8%)



Telavalue business models: Product as a service (B2B)

Description:

Data should be collected to measure how the product has been used, washed, dried, maintained, dry cleaned, transported, stocked, ...

In what circumstances the product has been used?

The data enables

Measurement of the durability of the product

Measurement of energy and water use

The use stage creates adverse environmental impacts (energy consumption and GHG emissions) through washing and ironing, and dry cleaning

Prediction of remaining lifecycle in normal use

The target is to

Minimize the energy and water consumption as well as GHG emissions during the lifecycle of a product

Minimize the number of products needed to fulfil the customer needs and maximize the lifespan of products

Assure that the material choices fit to the user needs and intended use of the product

Data-driven value proposition:

The customer can assess the environmental impact of the "product as a service" compared to other ways of providing necessary textile products

The service provider can detect pain points in own processes

Benefits to user of the garments?

Assumptions:

Data transparency and trust

Standardized ways to collect the needed information

Barriers:

Data collection would require notable technology investments if it is not a core part of the business

Extensive collection, management and sharing of data has a negative impact on sustainability

Privacy of the clothing users should be considered carefully

Prabod Munasinghe, Angela Druckman, D.G.K. Dissanayake, A systematic review of the life cycle inventory of clothing, Journal of Cleaner Production, Volume 320, 2021, 128852.

Vijay Kumar, Daniel Ekwall, Daniel Sun Zhang, Investigation of rental business model for collaborative consumption - workwear garment renting in business-to-business scenario, Resources, Conservation and Recycling, Volume 182, 2022, 106314



Telavalue business models: Take back (B2C)

Description:

Data should be collected to measure how the product has been used, washed, dried, maintained, dry cleaned, transported, stocked, ...

In what circumstances the product has been used?

What is the wear/condition of the garment?

What would be the resale value of the garment?

The target is to

Minimize the number of products needed in circulation

To prolong the lifecycle of the products

Data-driven value proposition:

Brand:

The less-used products with predicted lifecycle remaining can be directed to new users

Engaging the customers, acting responsibly, and getting feedback on product designs

The consumer can identify and resell the unused garments

Second hand retail gets more selection of goods

Assumptions:

Data transparency and trust

Standardized ways to collect the needed information

Highly connected home environment and tags in clothing or consumer contribution for data provision

Barriers:

Data collection would require notable technology investments or ways to incentivise users to contribute to data collection

Extensive collection, management and sharing of data has a negative impact on sustainability

Privacy of the clothing users should be considered carefully



What else could the data-driven service concepts be? (1/2)

Brand:

Financial benefits for the garment producer:

For the garments remaining long in use and reuse, the end-of-life tax is smaller than for the garments ending fast to the fibre-level recycling

Consumer insights:

how often the brand products are used

how long the garments are kept as part of the wardrobe

what kind of combinations are created with the brand garment

what type of customers seem to like or dislike the garments

what is the resale value of the brand products

how the items are recycled in the end of the lifecycle



What else could the data-driven service concepts be? (2/2)

Consumer:

Wardrobe LCA – how sustainable your garments are in total

Wardrobe value – the garment investment in euros

New purchases suggestions (from C2C marketplaces, second hand stores or retailers) to complement the wardrobe content to create new varying outfits

Information on maintenance of the garments and suggest refashion options

Guiding the consumers in understanding their personal consumption behaviour “2023 you have used only black t-shirts”

Information of a potential new user for an unused garment based on the usage and preference data collected from other users

Personal fibre quota (and services to compensate or buy additional quota)

- Total of owned garments

- Yearly quota for new fibre purchases

- Total use of recycled fibres in owned garments



Conclusion: Reflections on data-driven service concepts

The garment and textile industry should be able to produce fewer products, while increasing the lifespan of products and increasing/maintaining profits

The product must endure

The product must meet the purpose of use: materials, model and appearance

The product must be used until the end-of-life and not discarded early

The data can be used to measure different aspects of use stage and provide insights for the brand/service provider and for the user/customer/consumer

The data collection infrastructure needs investments, which in B2B can maybe be justified, but how about the consumer services?

The brands could provide incentives for the consumers to participate in data collection

The society would benefit from the data-driven services, if/when the environmental impact of garment industry would be reduced

The EU level and national legislation will have major impact on development of data-driven services and role of data in circular textile economy