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Co-creation Workshops to Envisage Integration of Design Innovation and Material Science in Smart Footwear Design Concepts

The MATUROLIFE project supporting well-being in older adults

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Background to MATUROLIFE

Urban areas in Europe are seeing an increasing population of older adults and existing approaches to care for them are becoming unsustainable. Assistive Technology (AT) can support older adults live independently, and without the need for care for longer. Despite the benefits, products are often regarded as unattractive and stigmatising to the user (Chaiwoo, 2013; Yusif, Soar, & Hafeez-Baig, 2016). The Horizon2020 funded MATUROLIFE project (**M**etallisation of **T**extiles to make **U**rban living for **O**lder people more **I**ndependent and **F**ashionable) aims to use smart materials to provide attractive and desirable AT. MATUROLIFE has produced an innovative selective metallization process that utilizes nanotechnology, electrochemistry and materials science to encapsulate fibres in textiles with metal.

This enables conductivity and electronic connectivity for integration of electronics and sensors into fabrics. The resulting materials will be used to produce smart assistive clothing, footwear, and furniture that are comfortable, and easy to use. To ensure acceptability of the resulting solutions the research involves active involvement of older adults throughout the development process. Here we describe the co-creation activity that is informing the development of smart assistive footwear. The methodology approved by Coventry University ethics committee involved interviews and co-creation activities (Lombardo, & Caribbu, 2018; Ramaswamy, & Ozcan, 2018) analysed through Qualitative Content Analysis (Schreier, 2012) and Thematic Analysis (Boyatzis, 1998).

Research Driven Development and Co-Creation

37 Semi-structured interviews



Explored the personal preferences of older adults and their experiences related to independent ageing. Identified key threats to independence.



Participants: 37 older adults, 26 female, 11 male. Average age: 71 years



In France, Italy, Poland, Spain, Turkey, United Kingdom

4 Exploratory co-creation workshops

Prioritised key threats to independence, reviewed footwear preferences and features, specified requirements

Participants: 37 older adults, 22 female, 15 male. Average age: 69 years

In Spain, Italy, Belgium, United Kingdom

2 Focused co-creation workshops

Co-created smart assistive footwear embedding functionality and exploring styles, material's and fastening

Participants: 19 older adults, 9 female, 10 male. Average age: 72 years

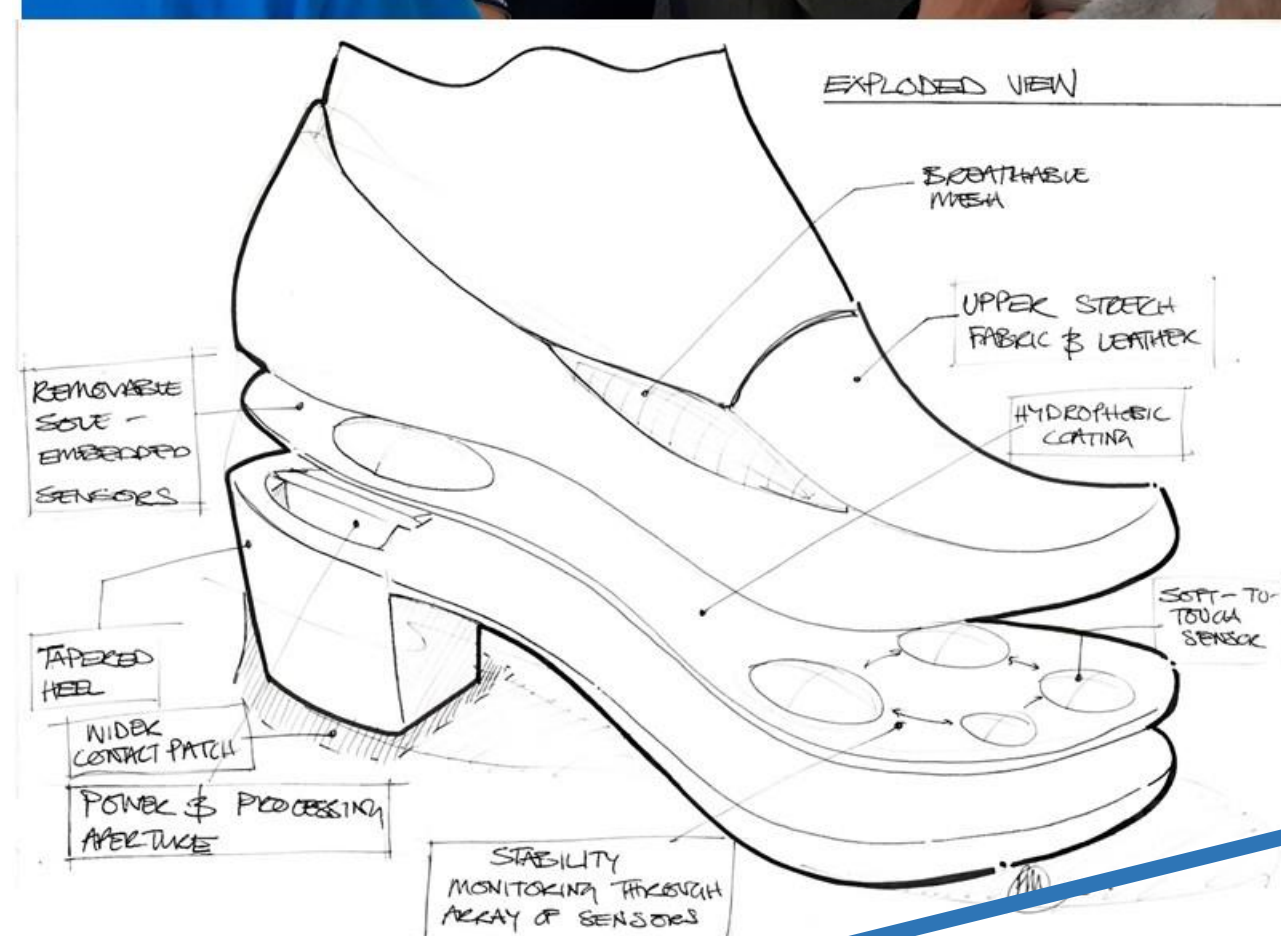
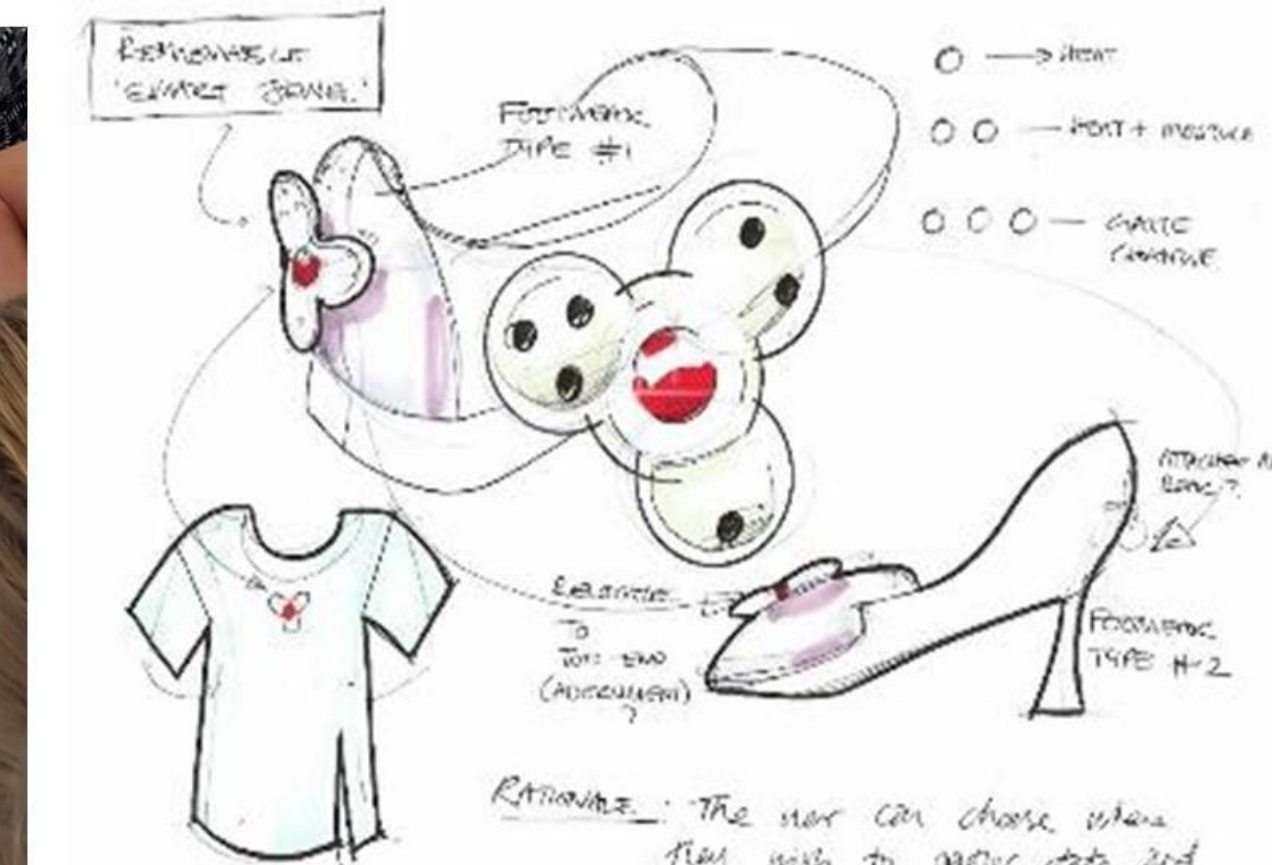
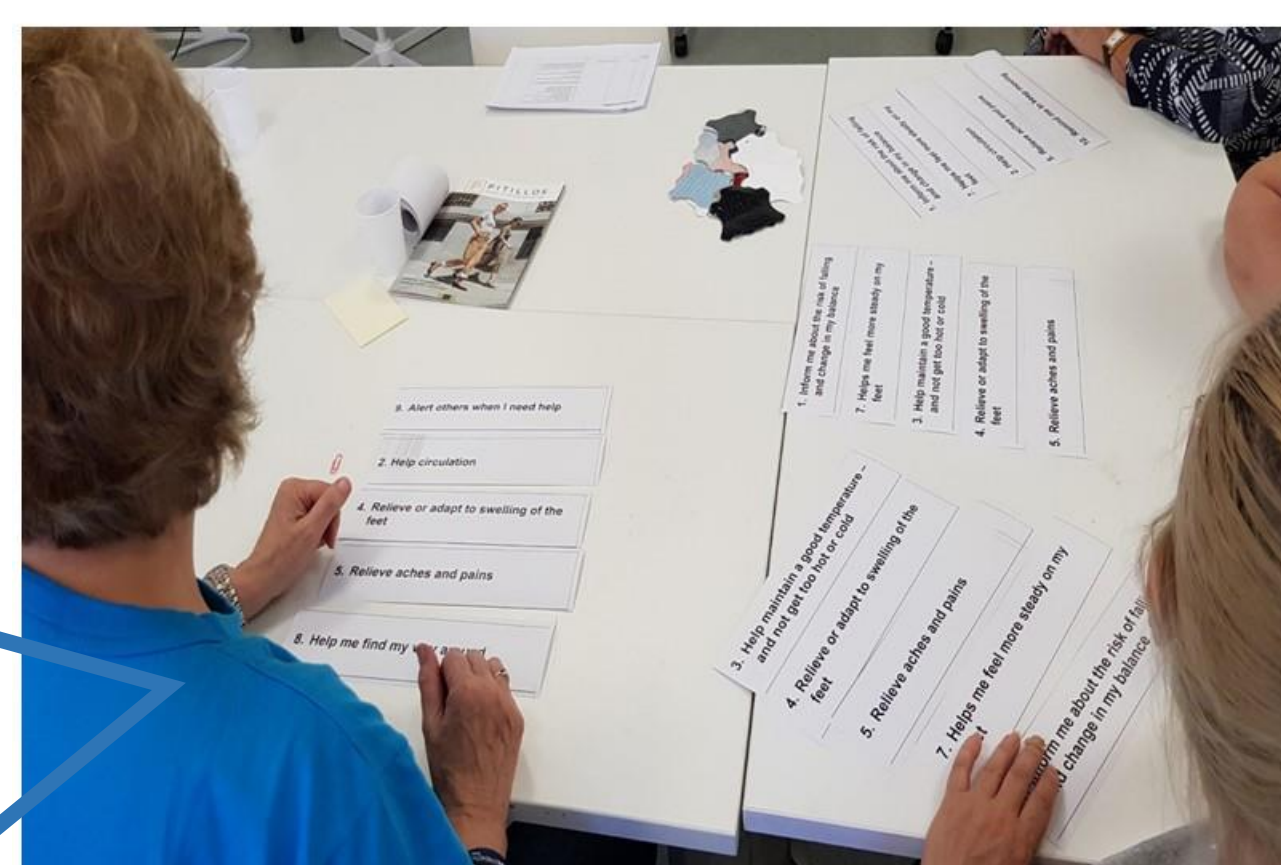
In United Kingdom, Germany

An initial Product Design Specification (PDS) and summary of Experience Highlights (EH) were formed. This included a summary of preferences and a design wish-list. participants were asked to agree on their most significant needs to be prioritised through design. Concepts were developed through multidisciplinary team working to combine functionality and styling requirements.

My needs and preferences are...

"Since I fell and I have limited mobility, I cannot bend, so I do not use laces, and need shoes easy to put on!"

- 'Proper' shoes are important for healthy ageing; comfort is prioritised.
- Footwear size may increase by 1-2 sizes
- Casual shoes that are easy to put on and fasten are preferred
- A gripping/non-slippery sole is prioritised to minimise the risk of slips and falls
- Larger base of the shoe for improved stability is important
- The toe of shoe/front of sole is raised up/curved up slightly to reduce trip risk



My priorities:

1. Inform me about the risk of falling and changes in my balance
2. Help improve my circulation
3. Help me maintain a good temperature – and not get too hot or cold
4. Relieve or adapt to swelling of my feet
5. Relieve my aches and pains
6. Provide information on my vital signs e.g. heart rate, blood pressure
7. Help me feel more steady on my feet
8. Help me find my way around
9. Alert others when I need help

My smart assistive footwear could include...

- A network of pressure sensors in an insole to map foot pressure
- Sensors to detect change in ground/floor surface texture and alert to fall/slip hazard
- A system to monitor and alert the user to changes in gait or in ground/surface using different types of alarm
- Increased thickness and width of the heel for improved stability/balance

Conclusions

Through the interviews and co-creation workshops our assistive footwear development has become focused on a key fear and priority of older adults across participating countries: balance and falls. A number of concepts are being iteratively developed. When integrating AT into garments through the use of smart textiles, it is important to focus on the user's priorities and needs as opposed to the garments being technology driven. This can be challenging in a large and complex European project that involves 20 partners and significant scientific / technical innovation. Despite the complexities of undertaking research and eliciting needs and requirements across 9 countries, MATUROLIFE seeks to embed user involvement throughout the life of the 3 year project through co-creation, iterative testing and a stakeholder panel to ensure our resulting products are desirable and usable without the stigma often associated with assistive technology.

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