

Sample Research Activities

Concept mapping to inform research process

INTEGRATING ELECTRONICS INTO CLOTHING

- * ELECTRONICS IN CLOTHING
- * CLOSE/LOOSE INTEGRATION
- * FACTORS AFFECTING DEGREE OF INTEGRATION
- * END-OF-LIFE
- * USE OF LESS CONVENTIONAL MATERIALS
- * USER 'TRAINING'

USER 'TRAINING'

Users are unlikely to be handed a 'user manual' when they buy an ordinary item of clothing. But they will need one for an item of Smart Clothes & Wearable Technology (SCWT) and thus such manuals will need:

- > To be written
- > To be explained to users

SOME FACTORS INDICATING CLOSER INTEGRATION

- Where traditional appearance would be spoiled by visible electronic systems if the equipment cannot be hidden in the garment
- Likelihood of casual interference with system by the user or others
- Likelihood of loss or damage to a device
- Garment electrical/electronic systems unlikely to change rapidly

SOME FACTORS INDICATING LOOSER INTEGRATION

- Rapidly changing technology
- Rapidly changing fashion of garment
- For easier end-of-life disposal
- Where frequent washing/cleaning

ELECTRONICS

There are many factors that can contribute to and affect the integration of electronics into clothing. Some factors that are limited to:

- > Simplifying the user interface
- > Measuring the user's needs
- > Body & fit
- > Non-embeddability
- > Identifying the user's needs
- > Identifying the user's needs
- > Providing the user with the necessary information

Left: Section of a concept map exploring factors contributing to and affecting the integration of electronics into clothing. Prepared by Mike Timmins (member of our project advisory team).

CLOSE/LOOSE

Depending on the fact, electronic systems can be more or less attached to the garment.



Above: Mary 'testing' garment features

Older user garment testing at the ISPO 2010 trade show

Mary Sinfield accompanied the research team to ISPO 2010, these are some of her field notes.

"The project team was concerned to learn how the sports and leisure wear industry was aware of and addressing the needs of the increasing number of over-60s, particularly as many of these were relatively well-off. I was there as an 'older user', effectively as a critical 'mystery shopper'."

"I was surprised at what I took note of automatically on entering each shop, i.e. its smell, lighting level, & ambient noise; how crowded it was (with people and/or garment rails/equipment or shop fitting displays); whether or not there was a sale or items reduced as I entered each section; and whether a sales assistant would be readily available to help me."

"I was very disappointed by so much clothing that took no account of the fiddliness to older fingers/projecting stomachs of 2-way zips, or small zip toggles, or small press studs or buttons, or pieces of Velcro."

"There is technology available that provides very lightweight, shaped, bonded materials, about which the public seem to be given little information by the fashion media. I learned about 'layering' and the different new materials that can provide warmth, insulation, and/or protection, depending on the needs of the activity. I noted particularly under-garments that were structured to support joints (shoulders, elbows, knees) or muscles (back, calves), and top clothing that was very windproof yet 'breathable'."

Special thanks to Mary Sinfield (OBE and member of national NDA advisory group) for talking part in our work at ISPO 2010 and subsequently in the UK.

Work Package 1: Behaviour

The project team at the University of Westminster has launched the first module of the survey system which is being developed in order to gather information on the needs and aspirations of the prospective users.

Since the beginning of the project the team at the Business Psychology Centre has been working in close collaboration with the other teams and experts in the project as well as with actual 'users' to develop an online questionnaire system. The first module of this system is now 'live', i.e. accessible for the participants, and can be found on the internet under the following address:

http://www.unipark.de/uc/wmin_psychology_staff/0541/

Everyone who is within the target age group and interested in walking is warmly invited to share their views and experiences using this questionnaire. In order to facilitate accessibility a print version (in convenient layout and font size) is also being developed.



Above: Qualitative data capture at user group workshop.

Fig. 1: 'Walking Module' questionnaire preview (all rights reserved, ©bpc 2010).

This initial module has been designed to be easy to use by the participants and will collect data which will help the technology and design experts better understand the needs of the users. The modules are designed to be completed in approx. 30 minutes and include new types of questions and responding options / scales to make the completion more enjoyable and interesting for the participants. Currently further modules are being developed which will focus on the use of technology, user friendliness of design and personal preferences as well as physical health and the so called 'feel good factor'.

A key achievement regarding the quantitative research has been the strong link with the University of the Third Age (U3A) which has been established via the Business Psychology Centre. The research board of the U3A has agreed to share their membership with the project team which will allow for a high volume of valuable data to be generated.

As the team would like the developments to have a perceivable positive impact on the lives of people it does neither make assumptions regarding people's needs, aspirations and preferences nor regarding a common 'concept' shared by users and researchers. Only by taking

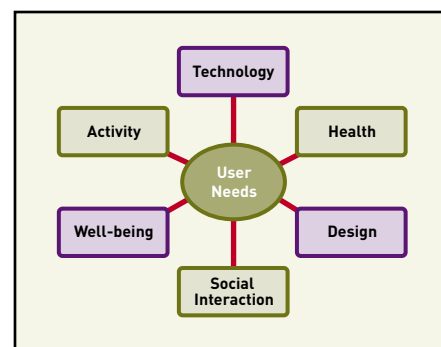


Fig. 2: Modular System Concept (all rights reserved, © bpc 2010).

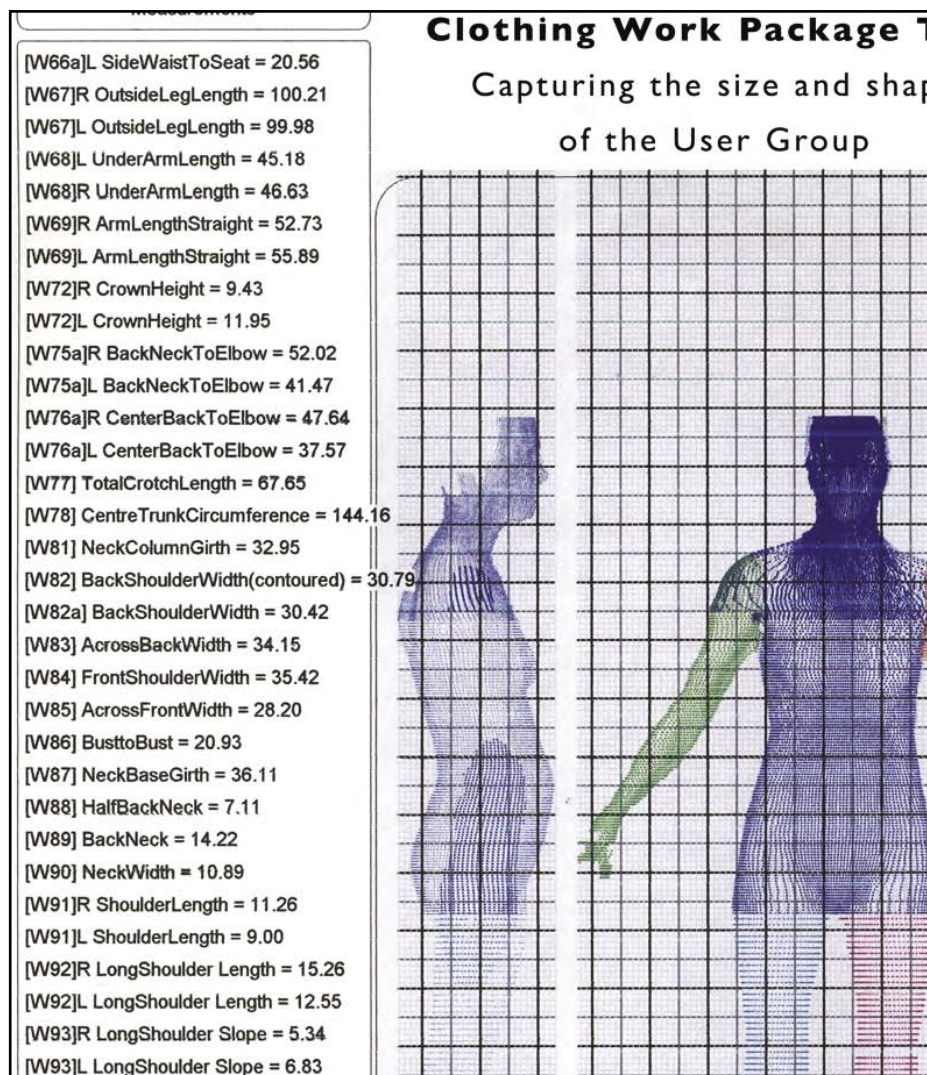
into account the many different views and perceptions of the participants from the perspectives of the different areas of technical expertise, which can be found in the project team, can we construct a framework which is both flexible enough to accommodate the individual preferences and robust enough to be useful over time.

Work Package 2: Clothing

The foci of the clothing research team, the user and advisory groups has been on the early stages of three-dimensional size and shape and co-design.

Engagement with the user group was initiated with the cooperation of local walking and ramblers associations. Introductory letters were sent to members of the groups to explain the research and inviting participation. A short questionnaire was enclosed seeking full contact information and height and weight. On receipt, body mass index (BMI) categories were calculated and compared to national averages. Those participants with BMI categories which were similar to national groups were invited to attend either the Caerleon campus of the University of Wales, Newport, or University College London for a three-dimensional body scan. The sessions were organised by the team and undertaken by Sizemic in a mobile unit, using a TC2 whole body scanner. On completion, the 3D scan images will be matched against SizeUK national 3D data, and those participants whose 3D data closely resembles the four BMI male and female shapes will be invited to be the representative set of fit models for the User Group.

Below: 2D Visualisation and physical measurements from 3D body scan.



Above: User workshops.

Concurrent initiatives involved members of the User Group being invited to attend two co-design sessions. The first was a two-day workshop where members of the research team and the Advisory Group discussed technical materials, principles of garment layering systems, traditional design and manufacturing processes and issues of sustainability within the context of clothing. This was followed by a 'show and tell' session designed to enable users to present their own evaluation of garments worn while walking. This session concluded with a presentation and discussion of the new Sprayway outerwear range. A record of user needs was documented and an analysis is being prepared for the next user co-design session.

Work Package 3: Technology

To date our work has focused on the evaluation of available technologies to facilitate the wellbeing of elderly walkers. These evaluations included technology workshops with end users to ascertain their attitudes towards smartphones, wearable sensors and technology in general.

In addition, experiments have taken place to establish the optimal placement for wearable sensors to accurately gauge physical activity, specifically walking. As a result of these initial experiments a preliminary technology framework has been compiled which outlines the possible technologies to be used.

Initial feedback from the user workshops has shown that touchscreen devices were seen as acceptable modes of interaction on a mobile/smart phone. Nevertheless, the default operation systems often confused users with the sheer number of functions on the devices, most of which would never be used by older users. Feedback was extremely positive when a

customised user interface was shown on the devices. This UI consisted of 3 basic functions. Two of which would be used often, phone, SMS Texting and activity monitoring. The use of a customised UI improved the user's overall experience of the device and the aim is to investigate how this level of UI can be incorporated within the garment.

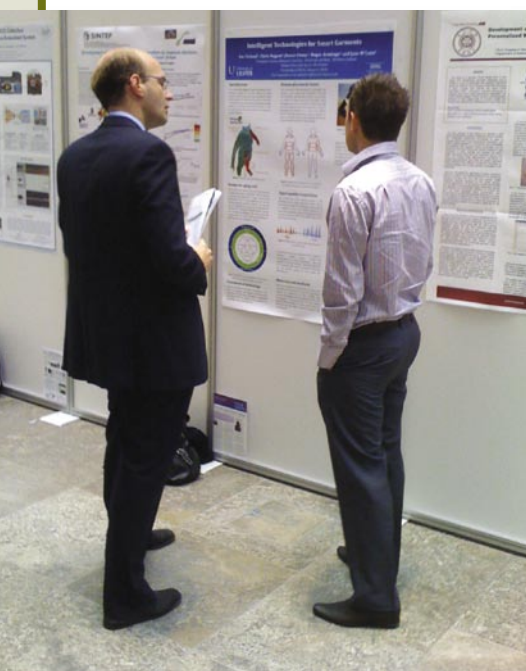
We have identified a specific sensor platform, which we believe will allow us to measure and monitor various physical and physiological measurements. It is a small wearable sensor that can communicate with other similar sensors in addition to any Bluetooth enabled smartphone or PC. Given the nature of the sensor's communication abilities we have identified a number of smartphone platforms that are capable of receiving the signals from the sensors and displaying them in real-time to the user. An algorithm is currently being developed that aims to accurately determine the step count and gross activity of the user.



Above: User workshop testing smart phones.

We have also been evaluating the feasibility of incorporating fibertronic technology, specifically textile based switches and keypads, into the technology framework. This integration is somewhat difficult as the current off-the-shelf products are often platform and application specific.

In conjunction with the aforementioned experiments, we have been working on the communication between the sensor platforms and a smartphone, which, it is envisaged, will provide the real-time feedback to the user. This involves testing the wearable sensors with a number of smartphone platforms such as Windows Mobile, Android and Symbian mobile operating systems.



Left: Presenting PhD work in progress at pHealth, Berlin 2010. (Photo by University of Ulster).

Right: Bespoke harness fabricated from elasticised polyester used to assess sensor position within the practical constraints of a smart garment. (Photo by Ian Cleland, University of Ulster)



WANG LU, Chinese Visiting Scholar

Associate Dean, School of Art and Design,
China Women's University, Beijing

I am currently working with colleagues in the Smart Clothes and Wearable Technology Research Centre based at the University of Wales, Newport. This one year scholarship has been awarded to me by the Chinese government to build on my interests in the area of functional clothing design.

Following my master's level study in the UK a decade ago, I have developed and launched the first Sportswear Design Course in China. This programme brings together multi-disciplinary topics, such as technical textiles, aspects of human physiology, and 3D cutting for movement, led by a creative, user-centred design approach. This Sportswear Design course has attracted industrial collaboration with domestic and overseas companies, providing students with practical project work leading to employment in this rapidly growing sector. Informed by a decade of teaching, research and professional practice, I have published "Sportswear Design Innovation" as the first book on sportswear design theory and practice in China.



Above: Wang Lu (third from right) and Jill Green, Design Director, LL Bean China, working with BA students in China (photo - Wang Lu).

1999 was 7%, furthermore, the population of over 65's in Beijing in 2008 was 15%. These large figures indicate a huge emerging grey market demand. To date, China has begun to develop community services for old people and medical research for the ageing but has had no focus on design research and development in product design or applications involving smart textiles and functional clothing.

As a visiting scholar, my involvement in this cross-disciplinary research project will help to inform the way forward for design for ageing in China. I am pleased to be linked to this network.

Right: Sportswear Design Innovation.



I have joined the team involved in the 'Design for Ageing Well' collaborative research project as I am interested in developing further a user-needs design approach for ageing people in China. According to National Statistics, the population of over 65's in China in



University of Brighton

University
of Wales,
Newport

Prifysgol
Cymru,
Casnewydd



University of Salford
A Greater Manchester University

University of
ULSTER

UNIVERSITY OF WESTMINSTER

For further information contact:

Jane McCann,
Principle Investigator
jane.mccann@newport.ac.uk

Jen East,
Project Administrator
jen.east@newport.ac.uk

University of Wales Newport
Smart Clothes and Wearable
Technology Research Centre
School of Art Media and Design
Caerleon Campus
Lodge Road
Caerleon
Newport, NP18 3QT

The views expressed in this newsletter are not necessarily those of the publisher or the University of Wales Newport. Whilst every effort is taken to ensure accuracy, the University of Wales Newport does not accept any liability for any claims made. This publication is protected by copyright, no part of it may be reproduced in whole or in part without the express written consent of the University of Wales Newport.

© 2010 University of Wales Newport.
Design: David Taylor. 07850 421149
david.taylor@students.newport.ac.uk