

# The New Dynamics of Ageing

The beginning of a new industrial revolution as textiles and electronics merge

*A time to address the design requirements of active older wearers - wellbeing and quality of life for an active ageing generation.*

*A generation of people that grew up with design at its core; a generation now much larger in numbers than the young; a generation actively seeking ways to enjoy life to the full and yet a generation not consulted in terms of design needs or targeted as a significant market sector.*



One of the cross-disciplinary collaborative research projects being funded by the UK joint research council's 'New Dynamics of Ageing'

programme, 'Design for Ageing Well', will consider the potential for a new generation of monitoring and responsive devices that can enhance the autonomy and independence of a rapidly growing older market. An active and independent lifestyle may be supported by combining leading-edge textile, communications and computing technologies to help the ageing population enjoy an extended safe and healthy life whether they choose to be up a mountain or on a local trail.

Traditional stakeholders in clothing, technology and care provision will engage in cross-disciplinary research, development and evaluation processes, with representation from older user networks, to inform a new 'shared language' and vision that may be easily communicated between these sectors and the end-users. The successful development of innovative functional clothing for the 'new old'

demands experts from disparate disciplines that include garment design, technical textiles, wearable electronics, Information and Communication Technologies (ICT), and social and health sectors, willing to engage in collaborative design practice with older users. Effective partnerships between researchers and potential users can result in better quality outcomes for all involved.

Jane McCann of the University of Wales, Newport will head up the project and will work closely with her team to collaborate with co-investigators from the University of Westminster, the University of Salford, the University of Ulster, the London College of Fashion and the University of Brighton. They will be supported by an Advisory Group made up of industry partners and trade networks. The project will combine skills and experience across a range of disciplines to provide a holistic view of what ageing means for society and for individuals by answering key questions about the forces driving ageing and what is shaping those changes such as technology, medicine, culture and demographics.

## First British Pensioner climbs Everest



At 65, Sir Ranulph Fiennes is the oldest Briton to summit Everest, and the first explorer in history to reach the

world's highest peak and the most Northerly and Southerly points on the planet.

The veteran explorer managed to achieve his goal even though he suffers from a fear of heights. At a press conference on his return, he said "I get vertigo, and don't like looking down. But if you are there, you might as well look once".

"When I actually got to the top, the emotional side of getting there was, to some extent, blurred by amazement at what we could see. Way down below, you could see the top of all the frilly clouds, and here, there and everywhere you've got mountain tops poking through. To use a cliché, it's just like fairyland."

The UK's Telegraph newspaper quoted a joking Sir Ranulph as saying 'It is amazing where you can get with a bus pass these days.'

***The application of textile based wearable technologies has been largely neglected by designers in the area of functional clothing for a rapidly growing market, the active ageing. Clothing is a major contributor to how people define and perceive themselves and is a necessary part of their everyday lives.***

Studies of the clothing needs of the ageing population suggest that stereotypes - the old as typically impoverished and unconcerned with appearance - are being challenged. What is lacking is stylish and comfortable functional clothing for active members of older age groups who do not suffer from such conditions. There is a current lack of understanding of the actual and potential role of technological advances in everyday lives of older people and developments have often failed to address their aspirations.

## Design for ageing well

Transient fashion ranges are not generally geared to the physiological demands of the changing older body, resulting in clothing that is often uncomfortable due to factors such as inappropriate fit, styling, proportion and weight. Smart garment design is becoming increasingly sophisticated in the areas of performance sport, an early adopter of textile and technology innovation, but is targeted primarily at athletes and the youth market and has not been adapted and designed in a suitable format for the benefit of older users. Medical devices have been developed for 'ill people' with little aesthetic appeal and with data feedback that may be difficult for the wearer to read and understand. Product development teams must embrace the design requirements of older wearers in terms of human physiology such as sizing and

shape, the ergonomics of movement, predominant postures, thermal regulation, moisture management, protection and the psychological 'feel good factor'.

We are at the beginning of a new industrial revolution with the merging of technical textiles and wearable electronics. The monitoring of body signs such as heart rate, temperature, respiration, activity levels and location may subsequently, over time, provide sufficient data to detect behavioural changes. Such advances could be utilised to promote health and wellbeing but may not be readily accepted by some older users due to badly designed user-interfaces that have small controls or displays that may prevent someone with a minor impairment from using them effectively. Little has been done to address physical and cognitive limitations when developing these new wearable products and related services to ensure that they are appropriate to the real-world needs of older people.

A new generation of older people, the 'Baby Boomers', has been accustomed to making choices in the design of their clothing and accessories throughout their lives. Within this period fibre driven textile development has embraced attributes such as stretch, lightweight insulation, knitted fleece constructions and waterproof and 'breathable' protection with user expectations and requirements developing accordingly. There is potential for key cultural, social and behavioural limitations

of the everyday lives of the active ageing community to be addressed by the use of a multifunctional technology-enabled garment layering system. This concept demands design practitioners to bring clothing, enhanced with unobtrusive assistive technology, and appropriately designed technology interfaces, to older users who will willingly wear and enjoy them. Set in the demographic context, where overall numbers of the over 60's are predicted to double to around 30% over the next decades, the development of core garment products for active ageing is now being recognised by the 'high street' market-leaders as a key factor for serious consideration in their future market-share.

### Identification of older user-needs

"Some great brands have come about by companies treating their customers as people, not as data sets". (Wolfe, D B with Snyder, R E, Ageless Marketing, Dearborn, 2003).

This has been the culture in the performance sportswear sector which has adopted more of a product design approach in addressing user needs. A collaborative design approach involves users in requirements capture, understanding and specifying the context of use, design



specification, and design and prototype development and evaluation. The psychosocial, lifestyle, health criteria together and motivational issues that influence personal choice in clothing, connectivity and daily life must be established in consultation with an identified individual or target group. Older users should be consulted throughout the technical design process in specifying and assessing the clothing

system prototypes being developed.

A hierarchal process 'tree', originating in Jane McCann's previous work; 'Identification of Requirements for the design development of Performance Sportswear' (2000, M Phil Thesis, University of Derby), addresses a breadth of technical, functional, physiological, social, cultural and aesthetic considerations that impinge on the design of clothing that is intended to be attractive, comfortable and fit for purpose. This tree of requirements uncovers topics and sub issues to guide the design development process for functional clothing. A new layer of issues may be added to this tree in order to embrace the emergence of smart materials and wearable technology. Major topics have been organised under the areas of 'Form', that embraces Aesthetic

Concerns and the importance of respecting the Culture of the End-user, and 'Function' that embraces the generic Demands of the Body and the particular

Demands of the Activity. While the main areas of investigation are organised under the main headings of Form and Function, 'Commercial Realities' is recognised as a topic with major impact on bringing innovative products to market for the emerging Active Ageing consumer.

### Commercial Realities

Baby Boomers' will add about two million extra older people to those aged 70 and over in the 2030s. (Metz, D and Underwood, M 'Older Richer Fitter: Identifying the customer needs of Britain's ageing population', Age Concern Books, 2005) They are now beginning their retirement and many hope to continue to lead an active lifestyle with increased time for leisure activities. Despite 'this being the only adult market with realistic prospects for significant sales growth in dozens of product lines for thousands of companies'

marketing remains rooted primarily in the materialistic values that generally hold the most sway over people in the pre-middle-age years of adulthood. Because of this, many members of 'the New Customer Majority' feel marginalised by companies and their marketers. (Wolfe and Snyder)

The international sports trade event, ispo, presented 'Best Ager', a market study that has identified the real potential for the development of sports lines for the active ageing. 'Best Ager' describes the target group of people aged 50 plus but deliberately ignores the age limit as this group represents a way of life in a changing society. This group is not restricted financially and feels free with regard to buying decisions. Their broad experience has made them critical about new offers; style codes and advertising

slogans don't impress them much. Statistics identify that only an approximate 30% of older people participating in sports find and

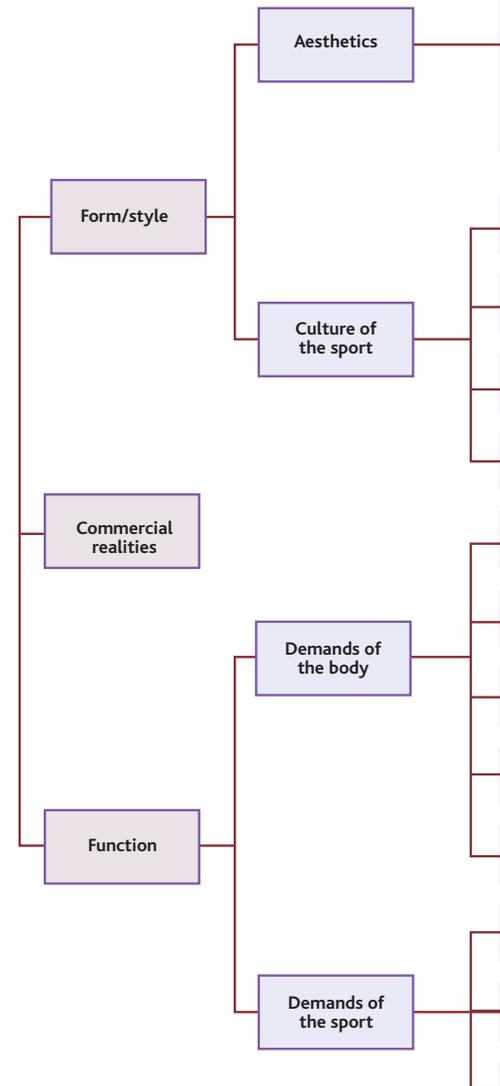
choose suitable products in specialised sports retail outlets with only 7% admitting to understanding the product. The survey indicates that quality is more important than price and that sales staff should be friendly and recognise customer competence. Proprietary articles, that promise quality, are more important than bargain prices. This group is motivated by sport to promote a healthy lifestyle with individual or group exercise for fitness as prevention to ill health.

### Sports layering system

The concept of the sports 'layering system' provides a reference point for the identification of design requirements for the development of functional clothing. (McCann, J: Material requirements for the design of performance sportswear in Ed. R Shishoo: Textiles in Sport, Woodhead Publishing, 2005). This normally comprises

a moisture management 'base-layer' or 'second skin', a mid insulation layer and a protective outer layer. Elements of personal protection may be incorporated into the system. The base layer is normally of knitted construction and, most recently, seam free garments have become prevalent. Varied knit structures, often with elastomeric content, may be placed around

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the body to aid wicking and offer increased support and protection. Mid layers incorporate textiles such as knit structure fleeces, woven fibre or down filled garments and sliver knit constructions, known as fibre pile or fake fur, to provide insulation by means of trapping still air. The outer layer, or 'shell garment', provides protection for the clothing system microclimate from the ambient conditions

by adopting a range of variations on woven or knit structure protective textile assemblies. Personal protective inserts, within the system, consist of knitted or woven spacer fabrics, wadding and foams or non-woven composite structures in varying degrees of flexibility or rigidity. A balance of aesthetic considerations remains key to the acceptability and wear-

ability of the final product. To function effectively the garments, and components, within the layering system must coordinate in terms of style, fit, silhouette, movement and closures.

market segmentation. (Metz and Underwood) Older people will generally spend more – sometimes much more – for products and services that serve as a gateway to experiential pleasures they covet.

### Aesthetic Concerns

The Baby Boomer Generation has grown up alongside rapid developments in textile and garment technology. In recent times fitness clothing and sportswear have dominated the leisure-clothing market and become fashionable as indicators of health and youthful stamina. Sports and fitness clothing styling is often unsympathetic to the changing figure types of older wearers.

*As people move into mid-life and beyond an interest in designer labels falls off because they are not as compelled to make social statements by their brand choices*

'People feel some insecurity about revealing their physical imperfections, especially as they grow older; clothing disguises and conceals our defects, whether real or imagined. Modesty is socially defined and varies among individuals, groups and societies, as well as over time.' (Jenkins Jones, S. 'Fashion Design', 2nd Edition, Lawrence King Publishing, 2005) An overall feeling of comfort inspires confidence with a neutral concept of comfort that may be achieved through addressing an appropriate balance of aesthetic and style, social and cultural and physiological concerns. The 'feel-good' factor may be enhanced through sensorial and aesthetic attributes and through reliability or perception of product reliability. (McCann 2000)

Functional clothing may be developed 'in the round' with design lines, related to fit, proportion, and the positioning of design features and smart attributes around the body, directly responding to the particular demands of the body and end-use. In creating functional garments, in relation to the contours of the body, both design lines and ergonomic cutting lines

often work in harmony and may merge into clean, minimal styling. An awareness of human movement, the support of muscles, protection, and workload, in combination with the application smart textile innovation, results in garments with design lines that maximise efficiency coupled with meaningful aesthetics. The concept of 'Body Mapping', as terminology introduced in the performance sportswear sector, directly links the identification of

the physiological demands of the body to 2D and 3D garment pattern development with the sourcing of appropriate textile qualities, constructions and properties selected and positioned to enhance comfort and functionality. Areas or

'zones' of the body are identified and mapped in relation to comfort factors such as ease of movement and articulation, predominant posture, moisture management, thermal regulation, impact and environmental protection.

### Demands of the Body

Physical deterioration is often due to reduced levels of physical activity that may be halted and reversed through exercise. It is recognised that a rise in obesity, diabetes and heart disease is resulting in an ever-increasing financial burden on government and private organisations. These trends stress the need for smart wearable textile products that help to make self-monitoring more accessible and positive for those who wish to keep fit or for those who find themselves gradually or sometimes rather abruptly becoming unwell. Gradual or dramatic changes in older figure types that impact on clothing design will be evident in terms of physical performance that declines with age include mobility, dexterity and the ability to reach and stretch and the need for protection. Particular needs

### The Culture of the User

**FORM** 'By age 60, people generally, there are exceptions as always – become relatively impervious to peer influence on their buying behaviour, especially those who are well along the path of self-actualisation.' (Wolfe and Snyder) The weakening of peer influences and of urges to impress others frees people to make life-changing decisions. 'People begin a search for the real self after years of catering to the needs of the social self.' (Wolfe and Snyder) The quest for life satisfaction in fall shifts

progressively away from a focus on things to focus on experiences. As people move into mid-life and beyond an interest in designer labels falls off because they are not as compelled to make social statements by their brand choices.' (Wolfe and Snyder) Purchasing behaviour of older consumers may be related more to health, independence and self-sufficiency than to other factors normally considered in

Fibre type  
Yarns  
Fabric selection  
Fabric performance factors  
Colour  
Cut/fit/proportion  
Detail and trim  
Garment construction

Corporate culture

Lifestyle subcultures

Historical context

Military research and development

Protection

Anthropometry

Ergonomics of movement

Thermophysiological regulation

Psychological considerations

Duration of activity

Safety/survival

Range of likely sporting conditions

**FUNCTION**

demand enhanced ease of movement for dressing and undressing and fastenings that address diminished dexterity.

The size and shape of the changing human physiology of the older body raises practical issues to do with garment cut and textile selection and the placement of wearable technologies that demand appropriate fit and positioning to optimise their potential functionality. Measurement and fit, in relation to different figure types, predominant postures and the ergonomics of movement, directly relates to the comfort and psychological 'feel good factor' of functional clothing for everyday use. SizeUK, has been the first national survey of the UK population since the 1950's and the first time that the changing shape and size of the population has been captured and analysed by means of 3D scanning technology. (Sizemic 2007) Garment design engineering may now address customised fit for different figure types, and predominant postures, providing opportunities for the technical design development of more comfortable prototypes for selected age groups in terms of size, shape and proportion.

### The Demands of the Activity

Physical exercise can improve physical performance in later life, as well as aspects of intellectual performance. Older people have the greatest need to maintain their exercise levels, and those with some disease related impairment may have the most to gain. Surveys find that walking is by far the predominant activity reported in surveys of older people. This can range from more extreme hill walking to more moderate exercise. There is the suggestion that the older people are taking more active holidays than the younger age groups, who seem more content with the beach. Older people want to experience the world for themselves, spending the money they have accumulated during a lifetime of work, before it is too late to enjoy it. Increasing numbers of older people are joining health clubs and gyms with the result that the industry claims that the over 60's are the fastest-growing membership group.



### Smart clothes and wearable technology:

Smart textiles may be sourced in a variety of knitted, woven and non-woven constructions, assemblies and finishes for application within the sports-type garment layering system. A moisture management base layer may incorporate separate panels with attributes such as antimicrobial fibres, moulded support and mesh 'zones' for ventilation. Sports bras and men's base layer garments, in seamless engineered knit structures, incorporate sensor networks with biomedical devices linked to communication systems and display devices to monitor vital signs. A mid insulation layer may feature engineered fleece construction, with variable insulation, or attributes such as phase change thermal regulation or electronic heated textiles. Outer layer protective garments may support tracking and positioning devices, soft switches for electronic

devices and flexible displays. Protection, that changes state from soft to solid on impact may be integrated within the garment system. The durability and performance of smart fabrics is being addressed through the adoption of emerging textile joining techniques such as heat bonding, moulding, and laser welding, initially used in intimate apparel and sportswear, and now adopted for the encapsulation of wearable technologies and flexible displays.

The attributes of stretch fibres have revolutionised the technical and aesthetic design of clothing and may be incorporated, in varying percentages, in warp and weft knitted structures, laces and nets, woven constructions, narrow fabrics and shock cords, and in some hook and loop' closures. The properties of elastomeric and mechanical stretch are of particular relevance to garment design for older figure types. Recent innovation embraces 'soft shell' garments that incorporate a hybrid mix of the attributes of the protection of outer shell garments with the comfort and insulation of mid layers. Stretch contributes directly to fit and to the embedding of

textile sensors and wearable electronics to be held in appropriate locations within garments, as in intimate apparel and base layer

garments, for sport and medical applications.

*Older people want to experience the world for themselves, spending the money they have accumulated during a lifetime of work*

Novel garment engineering techniques such as textile heat bonding and moulding and laser welding may be applied primarily to technical materials made from a high percentage of synthetic fibres. Functional design details, such as zip openings, garment edges and perforations for ventilation, may be laser cut to provide a clean and non-fraying finish. Waterproof zips, for main closures and pockets, sleeve tabs and hood reinforcements may be bonded without stitching. These joining methods may be combined to produce

ENHANCING FUNCTIONALITY



'sewfree' garments with clean design lines. Seam free knitting techniques are prevalent in the structuring and shaping of intimate apparel, base layer garments, in medical hosiery and in heavier gauge knitwear. These novel textile and garment manufacturing techniques are adopted for both the permanent embedding of miniaturised traditional and textile based wearable electronics, and for the incorporation of specific enclosures for removable wearable technology in garments constructed from knitted, woven and non-woven textile assemblies. Textile moulding creates control buttons for electronic switches. Conductive metallic fibres and polymers are used in light-

weight textile assemblies for soft key boards and as controls for wearable devices. Flexible solar panels may harvest power on outerwear jackets and fibre optics provide flexible displays on sports backpacks.

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PROGRAMME

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