Developing a visual language to enhance knowledge transfer in the design of smart clothes and wearable technology for the active ageing

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Abstract
Design has a rich iconographic based tradition of information transfer with its roots stretching back many millennia. This topic is evolving into a new on and off screen visual language embedded in our daily interaction with an ever-expanding range of physical and virtual tools. There is a need to be able to interpret the information presented through this new language with the result that vital meaning can be "lost in translation" between the conceptual development of the product and the amalgamation of technical functionality and needs of the end user. This is particularly important in emerging disciplines such as Smart Clothes and Wearable Technology, bringing together a wide range of cross-disciplinary skills and technical expertise. The challenge is particularly evident when attempting to create an understanding of potentially complex technical functions and benefits within the smart clothes space when addressing niche vertical markets such as the active ageing, where the “end user” may not be familiar with either the terminology or the emerging visual language.

Keywords
Active Ageing, Smart Clothes and Wearable Technology, Icons, Pictograms, Visual Language, Graphic Design, ISOTYPE.

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**Context**

Active Ageing was adopted as a term of reference in the late 1990’s by the World Health Organisation (WHO) as an inclusive message to recognise that there are drivers other than formal heath care affecting the way that individuals age. The WHO defines Active Ageing as “the process of optimising opportunities for health, participation and security in order to enhance the quality of life as people age” (Edwards, 2002).

The worldwide proportion of older people (older people are defined by the United Nations standard as over 60 years) is growing faster than any other age group. An increase of around 694 million, or 223 percent is predicted between 1970 and 2025. In 2025, there is expected to be around 1.2 billion older people, and by 2050 around 2 billion.

The demographic change is reflected in the UK statistics where in 2008 there was 11.8 million people of pension age or over, with this expected to increase to 13.9 million in 2026, and 15.3 million in 2031, when 24% of the UK population will be over 65. The biggest rise in the UK however will be in the numbers of older people over the age of 85, (the oldest old), where between 1993 – 2009 the numbers have doubled to 1.3 million, and are expected to almost double again to 3.3 million by 2031, representing 5% of the total UK population. It is interesting to consider that writing today in 2011, anyone who is 64 or older will be part of the 5% of the population over 85 in 2031, and anyone who is 44 or older will be part of the 24% of the population over 65 in 2031. Also consider that of the current cohort of 65-74 year olds, only 19% manage to undertake the recommended level of weekly exercise (Office for National Statistics, 2010).

There is gathering evidence that walking is the best exercise for the over 65s in order to mitigate the occurrence of falls – perhaps related to the strengthening of muscles, and the continuing ability to balance. This is confirmed by research being undertaken into the effects of dementia which suggests that anything that is good for the circulation is also good for the brain - including activity, in particular walking and having less fat on the body (Williams, 2010).

It is in this context that a collaborative research project, Design for Ageing Well is attempting to lead by design, applying user centric design methodologies overlapping with technology ‘problem and solution’ based approaches, analytical behavioural analysis and physiological care methods to create a technology enabled smart clothing system with the potential to enhance the autonomy and independence of the Active Ageing by providing a clothing based ‘comfort zone’ to ‘help’ participants to feel comfortable to continue to walk or take up walking.

In initiatives to bring new technology to market to the active ageing there are however potential issues to consider and overcome in the communication of both the benefits and
functionality of a technically focused clothing system. This paper seeks to address some of these issues in a discussion around the author’s involvement in this ongoing research.

**Background to the research**

The Design for Ageing Well project brings together a range of diverse expertise not commonly seen collaborating on a clothing based design project, and blends this with co-design principles, fully including the target end users as expert partners throughout the design process, where the project is designing for the future experiences of people, communities and cultures (Sanders and Stappers, 2008, pp.5-18.). A model presented below describes this creative circle can be seen in figure 1 and is applicable to both the design and development process as well as the knowledge transfer and communication issues, which is what the author is concerned with in this discussion.

![Figure 1: The creative circle in cross-disciplinary co-design of smart clothes and wearable technology for the active ageing.](image)

Around the circumference we have the four main “silos of interest” representing technical issues concerned with integration of wearable technology into clothing, and its use. Societal issues integrating with the feelings, motivations and aspirations of the Active Ageing. Design issues considering how to actually create functional clothing which is appropriate for the active ageing in terms of correct sizing, shape, proportions, function and aesthetic acceptance, and lastly, user issues, covering both the technology and the clothing – how to make use of technology, how to interact with it successfully and how to understand the technical attributes of performance fabrics and the clothing made from the fabrics. In the centre of the process we have a zone of “design ideation” where the participants from each area of expertise interact and learn from each other and contribute to the overall mixture of
requirements, design ideas and functionality, then carry back experience and knowledge to their own area of expertise.

The communication challenge within the development process is brought into focus when considering the broad range of inputs from these areas of expertise and the overlap between the disciplines. For example, the project technology team are working with conductive sensors embedded in base layer (next to skin) garments constructed using the latest knitting technology, which connect to wearable sensors used to measure kinaesthetic and physiological data. These can be controlled by soft switches embedded in garments, or connect to hand held devices to provide remote management of function and processing of data, and in turn connectivity to the cloud for upload and download of location based information and augmented reality services. All the while taking into consideration the real needs of the active ageing participants, and the challenges and requirements of apparel design and construction, from correct body sizing using full body scanning techniques, to the correct selection of performance fabrics and accessories. Ultimately the function and benefits of the output of research and development has to be communicated successfully to the end user for any real impact to be felt, and this adds another dimension to the process where communication beyond the participants in the creative circle is considered.

Figure 2: The creative circle in three dimensions showing the users on the second plane.

Viewing the creative circle in three dimensions allows the author to describe the depth in the process with the users positioned on a different vertical plane, but in the same position in the horizontal plane (Figure 2). This model parallels the proposition of the T-shaped person defined by McKinsey as having vertical specialist depth complimented by horizontal appreciation and understanding of other disciplines and professional contexts (Brown, 2009).
The synergy between this model and the communications model is useful as it visualises the design ideation process with the designer oscillating between the technical and societal areas, with a perpendicular connection down to the specific end user (the vertical specialist depth). This is paralleled by the designer providing the communications conduit between the technical and societal areas, with the vertical plane providing the specialist communication depth of both ideas and functions from the ideation plane to the end users (Figure 3).

![McKinsey's T-shaped person model](image)

Figure 3: McKinsey's T-shaped person model applied to the co-design process.

The co-design process undertaken so far through a series of "participant workshops" (held during 2010 at University of Wales Newport) in the Design for Ageing Well project has identified a range of technical possibilities in both the apparel design/function and the integration of wearable technology which needs to be overlapped with the user needs and user wants. The author’s examination of preliminary results from the workshops suggests that there are three key areas of communication for consideration; describing functionality, describing benefits, and actual functionality, with each of the three key considerations applying to three core elements of the apparel; fabrics, design features and electronics.

The author is concerned with how to effectively communicate the three key areas of consideration and visualising this matrix provides the opportunity to extrapolate the key streams needed in any visual communications strategy and suggests the need for a two-pronged approach. Firstly with an interactive visual language providing a gateway of understanding to the haptic interaction with the apparel design features and use of electronic technologies then secondly with a descriptive visual language addressing the need to describe functionality and benefits of fabric technologies, design features of apparel and any embedded electronics (Figure 4). Given the potential complexity in this process it is proposed that the use of pictograms and visual icons is key to the success of both the descriptive and interactive visual language – communication using pictures.
Communication using pictures

Pictograms are an ancient but familiar visual language which can describe function and process intuitively and visually with no need for words and in their pure modernist form could be considered the most intelligent invention of the 20th century (Nakagawa, 2006, p.6.). In 1997, Gaur proposed that Iconography supports memory. Whether in the form of simple line drawings or pictorial representations, single or narrative, iconographic images are able to store particular information so as to aid the memory of those who will eventually make use of it”, but to be successful pictograms must get to the heart of a message by visually explaining important information in a way that can not be misunderstood, is universally recognisable and culturally independent.

The beginnings of picture based communication

Earliest examples date from around 35,000 BC, which were very simple, just kerbs cut into a stone or a bone, and as proposed by Harris (1986, pp.1-166.), may be a forerunner of tallies or notched sticks recording important numerical data or events such as hunts, with strokes possibly representing a counting human finger. The first pictorial signs appeared around 30,000 BC, the earliest know being the Chauvet cave in France (Figure 5), but with others in Spain and Australia (Collins, 2011), but it is difficult to determine if they convey any specific message, other than being a pictorial representation of events, and as Abdullah and Huber
(2006, p.18.) state, ‘As they do not appear to represent a particular message they cannot be classified as pictograms (or icons)’. 

Figure 5: Left to right, detail from the Chauvet cave (Visual Arts Cork, 2011), Egyptian hieroglyphs, (Artisans of leisure traveler, 2011), icons from the 1972 Olympic games (Wagner, 2010).

Egyptian Hieroglyphs (Figure 5) dating from around 3200 BC (Allen, 2010, p.1.) could be described as the closest example of a predecessor to modern pictograms and when seen in context by someone who understands Egyptian culture, they are easily recognisable by the reader, with the meaning readable through abstract symbolism, they are as close to pictograms as we can get. However, although single hieroglyphs can represent an object or an idea, they can also combine phonetically with others to create different meanings and represent the sound of the language (Abdullah and Huber, 2006, p.19.), and as a consequence can not be described wholly as true pictograms. However it is easy to see where the roots of the modern interpretation of pictograms lie.

Recent interpretation

Pictograms were used in 1658 by Johan Amos Comenius in Orbis sensualium pictus, an atlas of the visible word (cited in Jansen, 2009), and sets of symbols to represent quantities used in Graphic Methods for Presenting Facts (Brinton, 1919, p.38.). In the 1920's Otto Neurath and Gerd Arntz developed the 'Vienna Method of Pictorial Statistics' which was later renamed ISOTYPE (International System of Typographic Picture Education), which along with the designs for the 1936 Berlin Olympics pictograms, had a direct influence on Otl Aicher in his designs for the seminal 1972 Munich Olympic Games pictograms (Figure 5) which draw from the ISOTYPE ideals of simple rules and universal understanding (Jansen, 2009, pp.227-242.). The figures in the pictograms have to exist within a square bound by an orthogonal and diagonal grid with all arms legs and bodies intersecting at 45° or 90° angles (Wagner, 2010) and set the tone for much of the recent contemporary development of pictograms, including the move from printed to on screen language.
Interactive visual language

Overview of evolution of an interactive visual language

Having extrapolated the proposal of two streams for a visual language in the design of smart clothes and wearable technology for the active ageing, it is interesting to look at the development and issues involved in the first those two streams.

The Graphic User Interface

Moving forward from the 1970’s to the 1980’s, one of the biggest changes in the use of pictograms and icons was the move from paper based to screen based visualisation, and the introduction of the Graphic User Interface (GUI), with arguably the key development in the late 1970’s being the creation of the Xerox Alto computer, the first implementation of a What You See is What You Get (WYSIWYG) screen based interface using icons in a mouse driven point and click methodology (The Centre for Computing History, 2011). The Xerox Alto was the inspiration behind the genre changing MAC OS 1.0 in 1984 (Rose, 1989, pp.46-48.), the first mainstream implementation of the GUI, highlighting the transition of pictograms and icons from paper to the screen.

This was followed by rapid development of the GUI throughout the 1980’s and 1990’s with regular upgrades to the mainstream computer operating systems (OS’s) Microsoft Windows and Apple Mac OS. The Apple Mac OS had introduced the concept of the GUI to mainstream computing, with Microsoft Windows providing a GUI to DOS personal computing systems. The period also saw development of specialised OS’s including Sun Solaris and Next Step (possibly the most important of all, being the platform on which Berners-Lee created the first web browser in 1990) (Singh, 2011), both providing a GUI to UNIX based systems previously accessed via a command line interface.

Creation of the Smartphone

1993 saw a crucial transition of the GUI from computer screen to the next important computing platform – the smartphone. The IBM Simon was the first smartphone with a commercial implementation of a touch screen (Druce, 2011), followed in 1996 by the Nokia 9000 series (Softpedia, 2011), both of which pioneered the use of screen based icons as a means of more intuitive control and interaction with a hand held multifunction device.

The phone revolution gathered pace through the 2000’s with feature phones and smartphones’ bringing their own interpretation of screen based pictograms and icons into play (Figure 6), all looking very similar, but all having subtle and confusing differences in design/interpretation and modality.
Smartphones and Design for Ageing Well

In order to have a measurable impact within the project time frame, blue sky ideas and development are outside the scope of the Design for Ageing Well project brief in terms of both budget and time so the requirement is for the use of available technology to develop smart garments, making use of what is currently or ‘nearly’ available to the market.

*Smartphone as information hub*

Initial research at participant workshops held at the University of Wales Newport, by the University of Ulster, (technology development partners in the Design for Ageing Well project) suggested that a smart phone may be one option for use as the information hub for the project (Burns, 2010). Some of the advantages of the smartphone as information hub were identified as; easily available off the shelf, programmable, robust, and reasonably familiar to the users. This is as an alternative to something such as glasses with simple Heads Up Display (HUD) systems, with data displays projected onto the inside of the lens of the glasses to be readable by the wearer. A smartphone was proposed to be capable of taking data from wearable monitors, interfacing with soft switches, downloading data from the cloud and potentially integrating with augmented reality interfaces, whilst being useable for the active ageing.

*Potential for user confusion*

However the platform of choice comes with some potential for user confusion, partly driven by the proliferation of pictograms and icons in use in the smartphone sector.
A survey of the 4 main UK mobile telecoms carriers offers an extensive choice of phones with icon based navigation systems, (with of course some model overlap between the network carriers), but combining the range of handset models from different manufacturers on offer with the four main open operating systems in the smart phone space (Symbian, Android, iOS and Windows Mobile) and several real time operating systems in the feature phone space, and an almost endless range of icon based interfaces it becomes potentially very confusing for any prospective user of a system (Figure 7).

<table>
<thead>
<tr>
<th>Network / price plan</th>
<th>Pay Monthly</th>
<th>Pay as You Go</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-Mobile</td>
<td>24</td>
<td>22</td>
</tr>
<tr>
<td>Vodafone</td>
<td>23</td>
<td>10</td>
</tr>
<tr>
<td>Orange</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>O2</td>
<td>47</td>
<td>47</td>
</tr>
</tbody>
</table>

Figure 7: Numbers of mobile handsets available on four largest UK networks.

It could be very challenging for the non ‘digital native’ (Prensky, 2001, pp.1-6.) 60 – 75 year old user to cope with the confusion in the range of available hardware and the interface options, so the creation of a sound visual language for this interface will play a key role in making the technology accessible to the target user group.

Descriptive visual language

Potential for confusion in fabric technology and naming crossover

As discussed previously, the need to describe complex and sometimes opaque technical terms and functionality in technical clothing is key to the success of the Design for Ageing Well project and the impact aimed for on the well being of the active ageing.

Some of the ‘customer’ communication issues could be said to be rooted in the use of written language and the organisation of technical and performance information as much as in the visual language used to provide ocular interpretation of functionality for the user. This can be easily seen when addressing some of the terms used in the technical apparel industry.

Use of technical clothing terms

For example, if we look at a selection of brand independent technical clothing terms shown in figure 8 where we can see some terms which may seem obvious, and some that are not.
At a participant workshop at the University of Wales Newport, one walker, who admitted that he was ‘a serious walker’ questioned the notion of wicking when used to describe a technical garment which moves moisture away from the body – his words were “what have candles got do with clothes”, the wick of course being the string in a candle that burns, with ‘wicking’ being the term used to describe the process of a garment constructed from a hydrophilic fibre actively moving moisture (sweat) away from the skin on the inside of the garment, through the garment to the outside (Taylor, 2010).

**Industry confusion with technical terms**

There is also confusion about terms in the industry, with ‘stretch’ being an example. In the UK the terms “one way stretch” and “two way stretch” are used to describe a garment which stretches in one plane, or stretches in two planes (along the warp or weft – one way stretch, or along both the warp and weft at the same time – two way stretch) whereas in the USA “two way stretch” is used to describe a garment which stretches in one plane (along the warp or weft), and “four way stretch” is used to describe a garment which stretches in two planes (along both the warp and weft at the same time) (Fowler, 2010). There is an extensive array of technical terms for the user to understand and for the brands and designers to explain in simple to understand terms.

**Materials and fabric naming terms**

Materials and fabric naming have the potential to add to the confusion of the active ageing customer, with multiple fabric manufacturers and apparel brands promoting both their own fabric technologies and garments made from specific fabric technologies in the marketplace.
Non customer contact brands, that is to say brands which make fabrics to sell into the industry but do not sell directly to the public under their own brand name have an extensive array of products, all named differently, but in many cases having the similar properties and very similar performance claims. For example; Gore has a range of seven fabric sub brands (Gore, 2011), Polartec has a range of 14 fabric sub brands (Polartec, 2010, pp.1-24.) and Pertex has a range of nine fabric sub brands (Pertex, 2011), all of which are used by multiple apparel brands in their garments.

Added to this, many of the apparel brands, the customer contact brands, use their own proprietary fabrics in addition to the fabrics supplied by the non-customer contact brands. For example in the UK, at the technical end of the market, the Montane range contains garments manufactured from a total of 64 different fabric technologies, some of which of which are 'own brand' and some of which are supplied by the non customer contact brands (Cosgrove, 2011, 89-92.). At the more consumer end of the market, the Sprayway range also contains garments using own brand and non customer contact brand fabrics, with a total of 27 different fabric technologies employed (Sprayway, 2011, pp.1-95.).

**Challenges in the retail environment for the active ageing**

When a potential active ageing customer is thinking about their needs and wants, they may do some initial research, possibly in a shop, online, from printed catalogues or through discussion with friends (Taylor, 2010). When they come to make a purchase the choice is the same, the sales channels are; physical shop, online shop, or printed mail order catalogues, all of which can provide specific challenges for the active ageing.

**Eyesight problems and retail challenges**

We know that as a result of the loss of elasticity at the lens, the eye is less able to focus incoming light at the retina, because of this optimal viewing distances begin to lengthen with age (a condition called presbyopia) from 8cm at 16 years, to 50cm at 50 years, to 100cm at 60 years (Granjean, 1997, p.266.) which can have a serious effect on the ability to read small text on labels and catalogue pages. The Royal National Institute for the Blind (RNIB) and American Printing House for the Blind (APH) guidelines recommend font sizes of 12pt and above (RNIB, 2001, pp1-140.) and 18pt and above (Kitchel, 2004) for use by readers with lower vision capabilities, guidelines which are difficult to follow on small information rich apparel swing tickets or costly printed catalogues where space is at a premium. Information elicitation can therefore be challenging for the active ageing at both the research and point of purchase phase where font size on associated printed materials is below the recommended size.

Issues with web pages in online shops are different. Although the font size is adjustable by the viewer via the controls of their web browser client software, the maximum average dwell
time on a web page is 10 seconds, with an overall range of between 3 and 15 seconds (Fahmy, 2010. Macik, 2010). So there is a limited opportunity to capture attention and explain functions and details to the customer.

In all three scenarios (physical shop, online shop, or printed mail order catalogues) it can be suggested that too much text would have a negative impact on the ability of the user / customer to obtain the information required to make a clear judgement on the attributes of a garment being considered for purchase, and that an appropriate use of graphic representation of functionality would be beneficial.

**Garment swing tickets and information labels**

This is given some focus when examining customer facing garment point of sale swing tickets from a sample obtained during field research at ISPO 2010 (The International Sports Business Network). The samples all set out to explain the same concept, that of “breathable” outer shell fabrics but with mixed success (Figure 9). Sample one is probably the most successful with a clear simple line drawing using a limited palette of colours, sample two is also legible but potentially too slick, using too much photorealistic illustration and does lose some of the message in the interpretation, whilst sample three is very complex, using a highly detailed technical drawing augmented with detailed text based technical information which is meaningless to the casual observer and possibly tries to do too much in a very small space both visually and intellectually.

Figure 9: Three samples of apparel swing ticket labeling describing breathable outer shell fabrics (Source confidential).
Figure 10 shows a selection from the range of descriptive labels from a non customer contact brand that have a range of 14 fabrics, all with different performance properties, and a range of nine additional finishes which can be applied to the fabrics to enhance and modify the performance capabilities (Polartec, 2010, pp.1-24.). The top row shows eight of the 14 fabric description labels, which are supplied by the fabric manufacturer to the apparel brands to use as co branding point of sale (POS) material. The middle row shows six of the co branding POS labels from the range of nine additional finishes available which can be applied to the 14 fabrics. Below that is the labels for the range of performance descriptors used by a leading UK customer contact brand which set out to describe the key performance features of their apparel which is constructed entirely from their own brand fabrics (Rohan, 2011).

Both of the brands make a good effort at explaining the properties of the fabrics / garments. The non customer contact brand (NCCB) has a carefully thought out range of labelling applied to a large and potentially confusing range of products, and the customer contact brand (CCB) makes a good case for simplification with clear pictograms.

**Overlap in the display of garments in the retail environment**

From the perspective of the active ageing customer there is still potential for confusion, as there is overlap in the way that the CCBs can display their garments. For example; a retailer may be displaying a range of very similar garments from CCB1, CCB2 and CCB3 where CCB1 uses own brand fabrics with own brand specific swing tickets. CCB2 uses a mix of own brand fabrics and NCCB fabrics from two suppliers, with a mix of own brand specific swing tickets and swing tickets supplied by the two NCCB fabric suppliers. CCB3 uses only fabrics from two NCCB’s, and swing tickets from the two NCCB fabric suppliers (Figure 11). There is
great capacity for confusion over the understanding of differences in fabric technical functionality, garment design features and technical function and reasons for cost differences in what may appear to be very similar garments (Booth, 2011).

<table>
<thead>
<tr>
<th></th>
<th>Own brand fabric</th>
<th>NCCB1 fabric</th>
<th>NCCB2 fabric</th>
<th>Own Labels</th>
<th>NCCB1 labels</th>
<th>NCCB2 labels</th>
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<tr>
<td>CCB1</td>
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<td>CCB3</td>
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Figure 1: Overlap in the labeling of CCB garments using own brand and NCCB fabrics and swing ticket systems.

**Attempts to address the issue**

An attempt has been made to address this issue by Premier Vision (PV), the twice annual fashion trade fabric show held in Paris and New York which has produced a range of ‘performance codes’ designed to be applied by fabric and textile manufacturers to their products in order to inform the apparel brands and the customers of performance attributes of the fabrics (Figure 12).

It is a valuable contribution to the information communication debate but Premier Vision do not have any real connection with the performance apparel sector where extensive use of performance fabrics are made – as an example, from almost 700 exhibitors at PV 2010, only one was present at both PV 2010 and ISPO 2010 (Premier Vision, 2011. International Sports Business Network, 2010) and it seems unfortunate that PV’s performance codes haven’t been adopted within the performance apparel sector.

It may be that although a valuable attempt at visualising the technical functional indicators, the PV performance codes are not as successful as they could have been. As pictograms they are actually quite challenging to ‘read’ as signs and without the accompanying text explanations many of the pictograms are difficult to comprehend. The design style is very idiosyncratic and visually ‘soft’ with combinations of line weights that do not scale well, and would be difficult to reproduce at small sizes (Figure 12).
It is worth critiquing specific instances to understand the problems, (1) does this indicate snow proof; filled with snow; warming; cooling? (2) these are also particularly ambiguous, especially at small sizes, with no real discernable meaning available from three very similar looking amorphous white shapes grounded on a black cross. (3) and (4) reverse the polarity of the design language, using very thin black lines and ambiguous symbology on a white ground. The two ‘droplet’ images being reminiscent of the ‘Danger – Corrosive’ symbols seen on liquid transportation tankers. In fact these two symbols are describing waterproof and breathable waterproof properties rather than corrosive properties.

Conclusion and further research

Summary of the discussion

Within the scope of this paper it has only been possible to discuss a sample of the issues emerging, but is clear that there is a distinct challenge for the active ageing to be able to navigate through the visual language communications noise associated with performance apparel based smartclothes and wearable technology.

The rapid developments in communications technology and the associated interactive visual language along with the complex technical properties and functions of performance apparel with the requirement for clear descriptive visual language is broadening the challenge. Companies in the commercial space are doing their own thing, the sector is inundated with
pictograms and icons with lots of overlap and repetition and in the performance apparel domain marketing and functional information is often confused.

**Position in history**

It is interesting to finish by looking back into the history of interactive and descriptive visual language. In 1995 it was argued that Gutenberg's printing revolution made language in its written form central to understanding and that the (then) developing screen based revolution was taking us both backwards and forwards into hieroglyphics (Kress, 1995) – using the success of something well proven to inform something new and progressive. Given the rapid increase in the use of technology – computers, mobile phones, control panels, remote controls etc. over the last 10 – 15 years and the corresponding proliferation of pictograms, icon and diagrams explaining things, if designers have lost sight of some of the key considerations for the design of successful visual languages appropriate to the user.

**Design considerations**

Some 21 years ago Mealing and Yazdani (1990, pp.30-39.) proposed a series of design considerations for a visual language which transcends the projection of the designers personal concepts into pictograms and icons:

- Graphically Clear
- Semantically unambiguous
- Have no linguistic bias
- Adaptable (modifiable to express shades of meaning)
- Simple (keeping a small footprint)

Since then, the predictions by Sassoon (1997, pp.155-175.) of screen based pictograms – colour, movement, background and three dimensionality have all happened. But as we can see daily there are almost endless variations of pictograms and icons all trying to make things easier to understand, but possibly making it harder for groups who are not digital natives (Prensky, 2001) and who are coming late to technology whether in an interactive or descriptive mode.

**ISOTYPE and Hieroglyphics**

It may also be interesting to see if it is possible to revisit the ideals of Otto Neurath when he developed the concept of ISOTYPE, where;

> "The first step in ISOTYPE is the development of easily understood and easily remembered symbols. The next step is to combine these symbolic elements. For example there is a symbol for shoe and a symbol for factory. By joining these two symbols we can talk about a factory in which shoes are made. By another
combination, we can discuss shoes made by hand. Similarly we can add the symbol for coal to the symbol for worker and we can make an ISOTYPE for mechanised mining and for pick mining.’ (Neurath, 1937, cited in Jansen, 2009, p.233)

Then there are the actuating concepts at the core of the rules of ISOTYPE: Superimposition, Conjunction, Concatenation, Transformation, Inheritance, Duplication, (Yazdani & Mealing, 1995, pp.133-142.) which can be applied to the design of pictograms for a visual language which has a resonance in Egyptian hieroglyphs which is a symbol based visual language, where a single hieroglyph can represent an object or an idea, but can be used in a personalised or customised way by putting them together to create different meanings or represent the sound of the spoken language. It is fascinating to see how a modernist interpretation can have a close visual synergy with the work of an ancient culture.

Further research

As discussed at the beginning of the document, this paper is a discourse around work in progress and as a consequence there is further research to be undertaken. The author will be engaging in more detailed research work with active ageing participants both in user groups, face to face and using distance based methods. In addition, engagement with selected apparel brands from different positions within the market space, from technical to high street will assess the impact of visual language on customer understanding. Also, user tests will be undertaken with interactive interfaces to determine the most appropriate directions for development of wearable technology devices for the active ageing with a view to contributing to the development of a visual language to enhance knowledge transfer in the design of smart clothes and wearable technology for the active ageing.
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