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Session 3B
Health Technologies
First Sketches for a History of Daily Living Aids

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Abstract
With the advent of new visions of disability and inclusivity, design has to find its role in order to provide users with optimal solutions concerning devices to improve independence and participation.
Although it is relatively easy to find references about the history of assistive products such as wheelchairs, prosthesis or orthoses, the task becomes more challenging when it comes to the history of daily living aids.
Being the type of assistive products which have better chances to enter general consumer market, a history of these devices is needed in order to understand what were the reasons that led these objects to be marginalized and to look for new paths to lead them into mainstream market, so that stigma and cost can be reduced, while access to devices for daily living can rise.
We make an attempt to draw the first sketches of what that history could look like, through a design perspective, by analyzing the development of daily living aids throughout the years, along with the fields from which they have emerged – medicine, occupational therapy and design.

Keywords
Assistive products; daily living aids; inclusive design; history

Introduction
Up until recently, the approach to disability from healthcare practitioners was one of trying to ‘heal’ people with disabilities, being disability connoted with negative values.
From society’s point of view, people with disabilities have triggered the feeling of ‘pity’, which, according to some authors, can still be seen nowadays.

In order to compensate or alleviate disabilities, people could make use of assistive products (APs). Most examples from earlier days consist in prostheses, orthoses and wheelchairs, developed by medical doctors or otherwise specialized professionals. Thus, it is not surprising that most histories of APs only contemplate these types of products.

Nowadays, and in accordance with the shift from the medical model of disability to a social model, people with disabilities are not considered to be ill or subject of ‘pity’. They are considered holistically on their capabilities, needs, goals and desires. The number of people with disabilities along with the growing number of elderly people, who have increased life expectancy and who develop disabilities natural to the ageing process, has lead to the emergence of a great market of daily living aids, which are those APs which are not to be worn, but to be used as help to perform daily activities (usually to ease
interaction with other objects), thus allowing for users to be independent and, as a consequence, to enhance quality of life and self-esteem. Nowadays there are thousands of APs and daily living aids (DLAs) available to consumers (AbleData’s database currently has a list of 22,000 available APs [1]).

Even though these APs are now recognized as having a very important role, there is lack of structured information in the literature about the history of DLAs. With the growing need to design more and better DLAs for people with disabilities, there is, in our view, a need to understand the evolution of these devices, as well as the role played by designers throughout the process. There is also an urgent need to understand this history since these types of products, within the range of APs available, have been said to be the ones with better chances to make their way into general consumer market. This paper, then, makes an attempt to draw the first lines for the writing of a history of daily living aids.

Ancient assistive products
When looking for references about the history of assistive technology (term coined by John M. Williams [2]), most retrieved matches refer to devices related to communication, information and software. Yet, in this paper we will focus on mechanical devices.

In the field of mechanical products, although there is not a single common term adopted and used throughout history to refer to them, there is physical proof of the use of these products that goes back to, at least, 5,000 years ago [3]. There is also a reference coming from Indian mythology: a poem, dated circa 4000 BC, describing how queen Vishpala, who was also a warrior, came to use an iron prosthesis after losing one of her legs in battle [4]. Other examples are easily traceable, like the first written references to prosthetic devices [5] to pictorial references about the ancient use of assistive products [6, 7].

Methodology
Searching for examples of DLAs proved to be difficult due to different nomenclatures used. For this paper we searched for references about the history of assistive products, disability, medicine and occupational therapy. Having found few examples, most of them related to hospital use, we then searched within online museum collections. We analyzed objects one by one. Afterwards, we made some research on references about antique objects and on references within the domains of ethnography and anthropology.

We have also collected examples for collectors’ websites and in books about the history of design. Within the latter, each time we found a reference to a company or designer who had designed for people with disabilities, we would look further into other projects of their authorship hoping to find other examples of DLAs. Finally, we have searched into patents registry to find different examples of objects designed for people with disabilities and its origins.

In short, rather than searching for specific terms related to assistive products and DLAs, we opted to conduct a more thorough analysis by analyzing as many products as we could, mostly within the home ware domain, and evaluating them so as to decide whether or not they were to be considered DLAs (or contributing to DLAs) and included in this initial DLA history.
History of daily living aids

While the history and evolution of prostheses, orthoses or even wheelchairs is somewhat easy to trace, in the field of daily living aids, tracking the devices throughout history presents some challenges. Some of the DLAs being used nowadays go back centuries ago, only at that time they were not grouped under the common term of ‘assistive products’, much less under ‘daily living aids’ – for instance, the shoe horn. Formerly called ‘shoeing horns’, these devices have been around since, at least, 1475-1500, when they were mentioned in the poem ‘A shoemaker’s verse testament’ [8]. Nowadays, there are several different models of reachers to ease the access at high shelves or distant objects. But by 1500, in Europe, priests would use a similar instrument for the Holy Communion to prevent plague from spreading [9] (Figure 1a). Another object still at use nowadays in different shapes and models is the pill box. Benion [10] makes a description of a pill box (circa 1635) which contained a clock within its inner lid to assist users in taking their dose at the right time of day.

Many of the objects which can be found nowadays in its original or modified configuration were used by nurses in hospitals. The most common examples are devices for incontinence and devices to assist feeding. Regarding the latter, it is known that already in the 17th century there were specific cups to help bedridden patients and children to drink a mixture called ‘posset’. Examples of these are the ‘spout cups’ (Figure 1c). According to Benion [10], there were older examples, but the first example of a ‘spout cup’ especially designed for people with disabilities dates from 1689. A somewhat different design of such a device may be found in the Science Museum collection [9]. It was made of glass and dated from around 1701 to 1890. Another model of feeding cups is the one with a half-lid, so that liquids would not spill while bedridden patients were using it to drink. An example from around 1780-1800 used in the United Kingdom may be found at the Manchester Art Gallery [11].

Still in the domain of liquid ingestion, already in the 18th century nurses used ‘sick siphons’, which were a sort of straws to help patients swallow liquids or porridges [9] (Figure 1e). Within cutlery solutions, there are examples of medicine spoons in the 19th century. One of the best known solutions was the one invented in 1827 by George Gibson, which became known as ‘caster oil spoon’ [10] (Figure 2h). A different example, dated c. 1800-1805 is a ceramic spoon with no handle (Figure 2f) produced by the English pottery company Spode [12].
Already in the 18th century the so-called ‘amputee cutlery’ could already be found. It usually combined knife and fork in a single device. These devices became known as Nelson knives in the 19th century (Figure 2g), due to Horatio Nelson who, in 1798 lost an arm in battle and used one of these [9]. They kept the name up to our days and may still be found for sale in different models. An example in the Science Museum collection presents a different model (spring operated) of a Nelson knife (c. 1845-1855). In a catalogue from Arnold & Sons, dating from 1906, a device for the same purpose may be found, only in this case instead of the usual combination between knife and fork, it gathers fork and scissors in the same device [13]. A different example of a combined knife and fork was used around 1795-1820 by Sir Richard Grindall who had lost his arm in the French Revolutionary War [9] (Figure 1d). This device presents some similarities to the pastry fork that we use nowadays, which is said to be invented in its present form by Anna M. Mangin (U.S.A.) in 1891 and patented in 1892 [14].

Within the ‘cooking’ and ‘preparing meals’ domains, there are examples to assist housekeepers in daily tasks. Several examples of devices to assist in peeling and taking the core out of apples might be found, like the apple corer in Figure 1b, dated c. 1690 [15]. Apple corers have been said in fact to be around since prehistoric times [15]. Other examples in the same domain are the Victorian bean slicers or the bread slicers [16].

Also commonly used in the 19th century were the sugar nippers [9]. Not exactly related to home food, but to ice cream shops, there is the example of the ice cream scoop which was invented by Alfred L. Crallle (U.S.A.). Noticing how people serving ice cream had trouble in detaching the ice cream from the spoon, Alfred L. Crallle designed this scoop which had a mechanism to detach the ice cream allowing for the person serving the ice cream to use it with a single hand [17].

Continuing in the food domain, it is possible to find plates dating from the end of the 19th century, which were destined to be used by people with disabilities and in hospital environments. Such is the case of the English plate with a reservoir for hot water to keep food’s temperature [18], or, for the same purpose, plates from the same time that enabled the attachment of a candle underneath them [10]. At the beginning of the 20th century, Arthur Everest Shipley (1861-1927) created a plate to help wounded WWI soldiers who had lost the totality or part of their upper limbs [9]. The plate was characterized by being deeper than regular plates. Using a fork to push the food against the plate’s walls was expected to spare the need for a knife in order to drag food onto the fork. Around the same time, in 1919, George Thomson invented a mechanical system to help WWI soldiers who had lost both their upper limbs to eat by themselves [9]. It was a complex system, meant to be operated through the user’s feet, which
comprised a large set of feeding and drinking instruments, like cutlery or glass holders, to be attached to the main structure. This invention became known as the feeding table (Figure 2i).

The WWI period was fertile for the field of APs. Either for purposes of training and rehabilitation or for assistance in daily living activities, several devices were created to assist injured soldiers. This phenomenon is also explained by the accreditation of occupational therapy as an autonomous field of knowledge, research and practice [19]. The archives of the Walter Reed Army Medical Center contain photographs depicting adaptations to tools and utensils in order to provide users a better grip [20]. The photographs in this archive depict adaptations made out of dental compound adapted to a hammer and to cutlery. An officer at the British Army created a chest pencil for a soldier who had lost both his arms at shoulder height. Since the soldier was not able to receive a prosthesis, this device was to be attached to his chest by means of a canvas strip, and it would hold a pencil for the soldier to write [9].

In 1934, Winston Cole patented a travelling toothbrush [21]. This toothbrush has the distinguishing characteristic of having considered grip in its design. The toothbrush is designed with a case for travel, which, once opened, slides to the other end of the toothbrush handle, thus allowing for an enlarged grip interface. In 1940, a patent by Nels Swanson of a key case pivot allowed for a better grip in using keys, while it also allowed for the attachment of a small flashlight on top of the device [22]. Seventy years later similar devices may still be found on several DLAs stores.

Bessie Blount, who was a physical therapist, designed a device to help WWII amputees to drink by themselves [23]. The invention patent from 1951 was filed under her married name: Bessie Griffin. Other women became known in the mid-twentieth century for their inventions for people with disabilities. Probably one of the most renowned was Lillian Moller Gilbreth who, together with her husband Frank Gilbreth, invented the famous step-on lid opener, widely used in kitchens today all over the world [23]. It was during WWII that the first APs created by designers came about. During WWII, designers Charles and Ray Eames were asked by the US Navy to develop a low cost orthosis for wounded soldiers [23]. In 1942 the famous plywood orthosis designed by the couple was born in response to the request. This device has remained, up to our days, a reference for design and design studies as a demonstration of how designers may ally functionality and low cost to high aesthetic quality [24]. Device’s appearance was, in fact, a real concern for war veterans who, after WWII demanded better services in prostheses design, regarding both functional and aesthetic issues. The USA government replied to the request in 1945 with the Artificial Limb Program, managed by the National Academy of Sciences, which was destined to prostheses and orthoses research and development. What follows is an excerpt from the 1947 report:

«It began with the recognition in the Office of the Surgeon General of the Army and on the part of others that prosthetic appliances for veteran amputees needed improvement both functionally and structurally, and were susceptible of development in the esthetic sense insofar as artificial hands were concerned.» [25]

In the 1950’s, at a time when machines, robots, and industrial production as a whole frightened workers by making them feel they were of no use anymore, the possibility of
being unemployed became a big problem, mostly for WWII veterans [26]. Henry Dreyfuss, a well-known industrial designer, designed, together with the Army Prosthetics Research Laboratory and Sierra Engineering Company, a prosthesis for hand amputees. This prosthesis' appearance represented a disruption from former models and the treatment of functionality was different from usual as well. The traditional prostheses were now replaced by highly functional ones [26] which, beyond that, clearly manifested through their design a concern for the way in which users were to react to their new prosthetic devices. In his manifest Designing for People, dating from 1955, Henry Dreyfuss explains that if for a housewife the feel of an iron matters, the feel of a prosthesis will be of even more importance to its user [27]. According to Serlin, this was clearly a new concern in prostheses' development. The author adds that this prosthesis was not only a change in terms of access to prostheses (which were now cheaper), but also in terms of status and users' self-esteem [26].

In 1947, in the United Kingdom, the company Nottingham Rehab Supplies is founded. This company is devoted from its foundation to the development and production of devices to support independent living and it is still running nowadays with a catalogue of about 3 500 products [28]. A year later, also in the United Kingdom, Homecraft-Rolyan is created. Its first line of work was towards hospital's occupational therapy departments. In the course of time, the company broadened its scope to the field of DLAs, which is currently their core business [29].

According to Fiell & Fiell [30], up until the 1960's, APs were designed under the medical model of disability, with little concern about products' appearance. Nevertheless, some objects may be found from before that period which (whether designed with that intention in mind or not) are in fact DLAs with a concern for aesthetics. An example of such an object is the mixing bowl designed Lurelle Guild in 1953 [31], which has the distinguishing characteristic of comprising a small handle so that the holding of the bowl can be made easy (Figure 3j). This object is part of the Museum of Modern Art (MoMA) collection and it was manufactured at the time by The Aluminum Cooking Utensil Company, who, interestingly enough, produced and manufactured the well known Wear-Ever cooking utensils, designed under a philosophy of producing durable devices, which is one of the main concerns in the design of assistive and inclusive products nowadays.

Although there were previous examples in the dressing domain, like the unbuttoning device patented in 1914 by Charles E. Collins [32], the mid-twentieth century saw the emergence of a large new set of DLAs related to clothes and dressing. In 1958 William MacLauchlan patented a device to assist people with disabilities in putting on stockings [33]. The Disability Museum portrays a 1959 photograph published in the Toomeyville Jr. Gazette of a wheelchair cape designed by Helen Cookman, which was especially designed for wheelchair users and developed in conjunction with the Institute of Physical Medicine and Rehabilitation [34]. Designed and patented in 1962 by Ellsworth Duncan, there is also a device meant to help users in opening and closing zippers which were located in areas of difficult access to the user [35].

London has its first store aimed at delivering products for left-handed people in the year of 1968 [36]. In 1969, when the international symbol of disability was designed by Sussanne Koefoed, a high pressure could already be felt, coming from minorities of people with disabilities who claimed their rights against discrimination and exclusion, while demanding more accessibility in public spaces. In this same year, the magazine
Design Journal launches an issue devoted to design and disability. This issue, who had Selwyn Goldsmith as invited editor, announced a line of tableware especially designed for people with disabilities by Russel Manoy, which had been launched in that same year. This line of tableware comprised a glass, two plates, a knife, and two identical pieces of cutlery which served as fork and spoon (Figure 3k). In the article devoted to this line, it can be seen that Manoy argued that designers should study ‘extreme populations’, so that they could dissociate from pre-conceptions they might have about typical users and of how objects should look like. For Manoy, this methodology turns the act of designing into a rewarding activity [37].

![Figure 3: j) Mixing bowl (1953); Tablewear (1969); l) Kitchen knife and cutting borad (1973).](image)

The walking frame, originally called Zimmer frame and created in the 1940’s by Andrejs Muiza, went through a series of different designs. And by the 1970’s the first walking frames with wheels (called ‘rollators’) were developed and commercialized in Sweden [38]. It was in Sweden, in fact, where great progress regarding the design of DLAs was made in the 1970’s. In 1969 a design company called Ergonomidesign is founded and by 1973 they had already designed a kitchen knife and cutting board in consultation with the Swedish Handicap Institute [39] (Figure 3l). This set is still available for sale through Etic – as are other objects designed several years ago by the same design company (e.g., Relieve Knifes, 1978; Glass, goblet and plate, 1978; Beauty Body Care Program, 1997) —, and is part of the MoMA collection (Figure 4m depicts a device from the Beauty Body Care Program kit). Together with A&E Design, these were the companies who designed the first DLAs which were clearly born out of an intention to design inclusive products and based on research conducted with users with disabilities [30, 40]. Both companies still exist nowadays and continue to design products under the same philosophy.

![Figure 4: m) Multipurpose grip (1997); n) Grooming tools and packaging (2000’s); o) Drive Medical bathing aids (2000’s).](image)

Another object from the MoMA collection is the Screwpull Corkscrew, designed by Herbert Allen in 1979 to reduce effort in removing the cork from the bottle [31]. The
MoMA collection also presents a cutting board designed by Mark Sanders in 1988 called *No spill*, which assists users in draining food cut over the cutting board to a container [31].

The iconic case study of *OXO Good Grips* starts in 1990. Seeing how his wife had trouble in using a traditional vegetable peeler due to her arthritis, Sam Farber decided he would like to design kitchen utensils which would be suited for people with difficulties in gripping the devices, thus founding the *OXO* company. The well-known design company *Smart Design* created for *OXO Good Grips* the first vegetable peeler with an improved grip. It proved to be a commercial success and it is nowadays used as a case study and as an example of how inclusive design might be profitable [41]. In the 2000’s, *Smart Design* widened the scope of the inclusive design approach by designing not only an inclusive product, but also its inclusive packaging for a company named *Denco* [42] (Figure 4n). Around the same time, the famous designer Michael Graves, after suffering from an infection that made him paraplegic in 2003, decided to invest his effort and time in designing objects for people with disabilities. A well known example is his collaboration with *Drive Medical* to whom he has developed bathing aids (Figure 4o). Nearly forty years after Papanek stating that the field of design for disability was still in the ‘Stone age’ [43], Michael Graves states in an interview for *MetropolisMag*:

"People who become disabled have to radically redesign their outlook about the physical world," Graves says, remembering the first days after he was out of danger and learning to live with paralysis. “They redesign their sense of privacy and their sense of independence. Yet in the products they have to use, design has abandoned them.”” [44]

**Conclusion**

At a time when there are increasing efforts being made to fade away the borderline between APs and mainstream products, this brief history of DLAs seems to us to make some sense, especially because from the evolution of home assistance devices it is possible to notice how several of them were not labelled as APs although being in fact objects of assistance. Some of the objects found from several years ago are still in use and may nowadays be found in APs specialized stores. Also, some of the examples of DLAs and inclusive products are now in exhibition in design museums as first-class examples of design. To us it seems noteworthy that some APs which are being exhibited in design museums, may at the same time be rejected if displayed in an AP specialized store [45].

One of our goals in tracking some of the antique devices was to raise awareness to the fact that they have been around for a long time and that they did not always carry stigmatizing values. The other goal was to widen the history of APs which is nowadays mostly focused on objects such as prostheses, orthoses or wheelchairs. People with disabilities have been forever coping with their daily challenges, while designers may sometimes fail to notice that.

This brief history also allows for one to see there is still fertile ground and real need for the development of new APs and DLAs as well as new inclusive products that will meet users’ functional and psychosocial needs.
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Bridging the Contextual Reality Gap in Blended Reality Space: the case of AGNES

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Abstract
This research explores where the contextual reality gap emerges in social sharing of knowledge, understanding and experience generated between users (also between a designer and a user) in different contexts. It then examines how this ‘contextual reality gap’ can be bridged effectively in the sharing of meaning through mediated communication within emergent virtual/physical space, in what we call Blended Reality Space. As a concrete example, we refer to our current project, AGNES, developing User-sensitive Home-based Systems for Successful Ageing in a Networked Society, funded under the Ambient Assisted Living (AAL) Joint programme. Finally, we propose a conceptual framework for managing, structuring and composing contexts in designing interactive systems, a new approach we refer to as the Contextual Reality Framework.

Keywords
Context, Ambient Media, Tangible Object, Presence, Blended Reality Space

Introduction
In general, contemporary information/communication technology has broken through boundaries between cultures, societies and even political systems, but has not yet overcome the communicational boundaries that arise from a lack of shared understanding, a contextual reality gap. Understanding how people really are is difficult in cross-cultural communication. We unfortunately tend to blame “those foreigners”, for their apparent stupidity, deceit, or craziness when it is actually obvious that we often just don't understand people of different contexts [1]. In most mediated communication there is a much greater potential for misunderstandings and misinterpretations due to the lack of the expression via multiple senses [2]. One important feature of modern communication patterns is their lack of symmetry. By this, we mean that the different participants involved in a communication and collaboration are often in different physical situations, which may have very different characteristics. And increasingly, they may be using different types of communication devices. In two completely different situations the same message could be interpreted very differently [2].

How can interactive systems effectively help with bridging the reality gap generated between different users’ perceptions in different contexts? In order to explore where the sharing of reality is restricted or concealed, we more closely investigate everyday life communication that creatively and effectively enables mutual understandings
between people. Everyday communication contains hidden resources for creating the harmonious accord of people and things in interaction design.

**Meaningful Communication in Everyday life**

Communication is commonly assumed to involve a meaningful linguistic exchange. However, when we look carefully at everyday-based communication between families, close friends and loved ones, they communicate like a synchronized instrument, each anticipating the wishes of the other, when they make communication without or with less explicit information. Imagine our everyday life, for example, when a child comes home from her/his school, sits on a sofa, has a soft drink with gulping, summarises her feelings about the way things went at the classroom. If her/his mother wants the details, she may have to listen for a while, yet she perceives in an instant a significant message about her child, with implications for what kind of evening they are going to spend.

Michael Polanyi, in his book “The Tacit Dimension” [3], refers to a gap to be bridged by an intelligent effort on the part of the person to whom we want to tell what a word means, and points out, for example, “our message had left something behind that we could not tell, and its reception must rely on it that the person addressed will discover that which we have not been able to communicate.” [3] The hidden meanings contained in the silence and blank intervals are manifest in our sensory perception. Communication relies on how well people provide and utilize the ‘empty space’ so they flexibly make own images to fill the spaces in their sensory perception, and how well we accept the images of each other.

Empty space is an important component of communication. It has a multiplicity of meanings and signifies both temporal and spatial principles, an interval of space and time. It can be the specific time that characterizes the interval of music or dance [4]. It exists in the visual arts, architectural and urban environment as well. For example, space itself is perceived entirely different between cultures. In some cultures, especially Japanese culture, spaces are perceived, named, and even revered as the ‘MA’, or intervening interval. In western culture, mainly, people perceive the objects but not the spaces between [5]. They pay attention to the object-arrangement. In contrast, in Japan, it is the arrangement of the spaces, it is the interval [4] that is most salient. Many scientists, architects, space designers, communication designers and artists have paid attention to this phenomenon [4], [5], [6]. The empty or interval time and space opens and closes, swells and contracts. It gives new solutions and new ways of communication, if there is constant attention to the use of space as though it were endowed with unlimited functional flexibility [4]. Recent interaction designers have paid greater attention to ambient information in everyday life. For example, people also communicate with the natural sources of ambient information to interpret how things are around us in everyday life. This communication is not linguistic conceptual exchange, but people intuitively interpret what is of value for their purposes in their current environment and try to become harmonious with it in everyday life activities [7].

Unfortunately, this ability to convey ideas does not transfer well to humans interacting via computer [8]. Communication and collaboration through conventional computer and telecommunication systems diminishes the qualities of interaction that produce a sense of directness and richness, because of their limited capacity to convey a reality with contexts shared between users [9]. Context is an important, yet poorly understood and poorly utilized source of information in interactive computing [10].
the following section, we propose a conceptual framework for managing, structuring and composing contexts in designing interactive systems, a new approach we refer to as the Contextual Reality Framework.

Context and Contextual Reality

We previously discussed a meaningful communication with frequent use of ‘emptiness’ that largely lies in context. Hall [5] has described this phenomenon with a different term, high-context communication where “the communication or messages is one in which most of the information is either in the physical context or internalized in the person”, whereas low-context communication is where the information is vested in the explicit code explained through words and verbalization, just as two lawyers in a courtroom make a trial. The closer the relationship the more high-context communication arises, drawing on shared meaning. But how do we derive ‘meaning’ from the empty space internalized in the person, while the coded, explicit, transmitted part of the message conveys very little? Figure1, based on the hi-low context continuum originally proposed by Hall [11], represents our concept of the Contextual Reality Framework and shows how emptiness and meaning have a strong relation established through this communicative process.

In general, context refers to the conditions in which a communication exists that make its meaning understandable. Meaning, hence, can be clarified by such contextual cues as the surroundings, circumstances, environment, background, or settings. More specifically, subtle cues such as weight, texture, smell, airflow, sound, light so on contribute to context. A contextual cue is a catalyst that facilitates creativity through sensory experience. According to Krippendorff [12], “Sense is the feeling of being in contact with the world without reflection, interpretation, or explanation.” It is implicit and not easily externalisable in words. Naturally synchronized communication in everyday life largely relies on the unconscious affirmation of the sense of being filled up and of filling up an emptiness with contextual cues.

Perceptual experience is a group of sensations automatically retained and integrated by concepts, which gives it the ability to capture the current state of being in a world. It takes place externally, in the present, the here and now, neither in the past nor in the future [13]. Awareness largely follows behaviour, rather than vice versa, as if we have a sense of direction while being in motion. Our bodily involvement with perceived objects and our perception of objects are inseparable. We tend to believe that most of our actions are carried out consciously. It is, however, our unconscious motor behaviour that preserves the natural flow of action in specific situations. We become harmonized to things that all of us end up doing without really thinking. It is meaningless to think of mind, body, and context separately.

Conceptual experience is based on information processing such as problem-solving, analysing, thinking what happened in the past and what can be expected to happened in the future [13]. It invokes conscious mental behaviour expressing with verbal communicating and an imagined body. It is the process of mental realization including sense, perception, memory and even judgment. Hence, it is not easy to make a clear distinction between sensory, perceptual and conceptual experience. Lakoff and Johnson [14] pointed out that “It is as though the ability to comprehend experience through metaphors were sense, like seeing or touching or hearing, with metaphors providing the only ways to perceive and experience much of the world.”
The Contextual Reality Gap

Many specific domains, for example those of nurses, doctors and management people in healthcare, require abstract and objective data, with explicit expression. In contrast, their patients and clients - elderly people with mild cognitive impairment - have different needs and characteristics. It is known that they retain concrete implicit skills even as they lose explicit, abstract knowledge and skills. There is a contextual reality gap between people at home and professional people in the healthcare domain (figure 1).

![Figure 1: Contextual Reality Framework](image)

The needs of the dependent old people and their carers, as primary and secondary end users, should be considered carefully, but the focus on the elderly as primary user has to be kept central. The primary users normally have difficulties dealing with explicit knowledge and memory such as understanding texts, making inferences, encoding information into memory, and retrieving information from memory. Contrarily, other mental processes show little or no decline with age. Recent notable approaches try to improve cognitive function by exploiting intact cognitive process such as implicit memory [15] [16] [17], which refers to memories from prior experiences revealed by performance effects in the absence of deliberate recollection [18]. Elderly people are still capable of using and being influenced by their past knowledge, whether they are be aware of it or not. This is an automatic or unconscious form of memory [19] [20]. They have knowledge that their muscles physically remember, but explicit sources of knowledge such as user’s manual, verbal assistance, and so on, are unsuitable for them.

The secondary users caring for the elderly, such as family members or close friends, need to actively connect to the network and access information on the person’s well-being and activities (if approved by the elder) to get a picture of the elderly person’s state. They also need to be informed about subjective states and activities of the elder to allow for a much better tailored and timely response. By this approach, ICT-based environments will pervasively penetrate into the everyday lives of the elderly. If the technology itself can be designed to disappear from perception in use, there will be no conscious effort of access to information nor effort of interaction [21]. There will be no gap between the emergent virtual/physical space of technology and the physical world; this is a true blending of the physical and the virtual, what we call **Blended Reality Space** [22]. True blended space will release
human actions from physical constraints and the physical–virtual disruption, and provide natural flow of action, equivalent to that in the physical world. The blended spaces can be expected to also produce a strong psychological feeling of presence within the merged space, since the technology effectively disappears from attention [13] [23].

In communication by mobile phone in an emergency situation the sender and receiver, unaware of the context in which the phone call was made and received, are at risk of misunderstanding each other. Exchanging tangible knowledge to avoid this risk and using peripheral attention capabilities could deepen mutual understanding. Optimal combinations of tangibility and evoked presence carry the potential to make full use of, while not overburdening, the flexible but limited capacities of selective attention; this will be a key issue for the design of future interaction approaches, what we call Tangible Presence in Blended Reality Space [22]. The more abstract information is provided for users, the less they feel tangible presence (Figure 1), and this is not suitable for elderly people. A potential approach would be to use sensor technology to monitor the sender’s state directly through the availability of the present external situation, visual features of the surroundings and the periphery. Such information could be presented to the receiver in a variety of different forms, and transmitted as embedded information to any form of communication [9]. As a concrete example, our current project, AGNES: user sensitive home-based systems for successful ageing in a networked society (funded under the Ambient Assisted Living (AAL) Joint programme) will be presented.

The Case of AGNES: user-sensitive design

Figure 2 is a schematic outline of our approach: a context-sensitive home-based interactive system, in which humans utilize background information with ambient media by means of a tangible object but without being disrupted in their foreground tasks. Our user-sensitive home environment will support a personalized and human-centred care process by detecting, communicating, and meaningfully responding to relevant states, situations, and activities of the elderly person with regard to mild cognitive impairment. It is the combination and integration of home-based ICT and social networks, connecting the elderly person living at home with their families, friends and carers.
This system is composed of ambient displays, tangible interaction objects and interaction mechanisms and protocols, including gesture detection, which makes for easy-to-use and natural interaction. The tangible object and the ambient display complement each other and provide suitably gentle notifications and other information, and establish communication with connected persons. The human focusing of attention between background and foreground has to be a smooth transition, which makes possible to achieve a natural flow of actions without awareness. By using commonly available and cost effective technologies such as cameras, motion sensors, and mobile devices, the system develops a suitable algorithm to classify the body pose and methods to associate the extracted pose information over time with gestures by detecting the users’ states and activities without any use of intrusive sensors [24]. Elderly people living at home will use the system actively by accessing information, sending messages or requesting services.

**Ambient display and tangible objects in AGNES**

The main idea of an ambient/tangible interface, built on movement and position sensing techniques, is to provide physical forms which serve as both representations of and controls to digital information. The applications make the digital information directly manipulable with our hands, and perceptible through peripheral senses by physically embodiment [25] [26] [27].

In everyday life, we pick up natural sources of ambient information to interpret how things are around us. For example, people could experientially interpret implicit information from outside the window. A sensitive combination of brightness, wind direction and humidity gives us the feeling of the coming rain. The perceptual feeling of peaceful curtain-wave makes people placid, or people foresee a storm when they see the curtain waving in the dim light of the window, with no explicit information. This system will generate a variety of ambient media such as sound, light, airflow, colour and the combinations for background interfaces for awareness of virtual space at the periphery of human sensory perception (figure3).

![Figure 3: Ambient display in AGNES](image)

The elderly person connected to others through the social networking technology receives information such as messages or stories from family members and others transformed into a variety of ambient forms through an I/O unit. For example, the combination of subtle wind and green LED implies notification coming from family
members, mid-level breeze and red LED gives important information from them, and strong wind and vivid red LED indicates emergency message from them.

Two fans are attached to the wall of a profile made of MDF-board (figure 3). The profile also serves as an air intake tube for the fans. In addition, two upward facing green and red LED-spotlights are attached to the same profile. The light is focused to the middle of a white curtain that is made of a light material such as polyester flag fabric. All control circuits, including a central processing unit (CPU), are integrated into the MDF-profile. Both fans and LED-light can be controlled, using Bluetooth, from an ordinary PC remotely located.

Now imagine a situation in the physical world, where an elderly person needs to ask questions of his or her relatives or neighbours. The elderly person may lay a hand on the relative’s shoulder, or may knock on the neighbour’s door. If it is an emergency situation, they may strongly tap relatives or may knock the door severely. The contextual cues on the surface of the tangible object provide access to implicit memory (figure 4). It affords tapping to contact a loved one. We need to carefully choose contextual cues suited to various situations, wood texture to afford knocking, boa material to afford stroking and knit material to afford tapping, based on everyday life objects (figure 4).

The ambient display combined with the tangible object in the context of a person’s home form a Blended Reality Space, comprising a radically new way to manage social interaction.

Figure 4: Tangible object in AGNES

**User Involvement**

Users have been involved in the design and innovation process throughout the project, from requirements specification to the design process itself, and on to taking part in testing and evaluating implemented components and the developed prototype systems. For design, we rely heavily on focus groups and end user volunteers living in Sweden, Spain and Greece.

In an initial trial, qualitative interviews with three different focus groups, totally 25 participants, have been conducted in Sweden. All participants are seniors between the age of 65 and 94 and living in their home. The interviews were recorded by audiotapes and field notes. We have exposed design concepts to user groups, using mock-ups, storyboards and video prototypes. These meetings provide feedback and inspiration for our ideas about interaction for this group of users. Implemented devices have been evaluated for technical performance and user experiences in
actual use in real home contexts. In addition, social impact and psychological effects on the older person will be specifically assessed.
The limited functionality and the simplicity of the ambient display and the tangible object are appreciated by them. Their comments suggested that the ambient display should be installed in an appropriate location at their home to effectively sense and recognize the implicit information. Such interaction methods as tapping and knocking on the selected materials are also for the most part appreciated by them. However, their comments urged us to reconsider the detailed shape and material with regard to holding it more easily, and considering from the ‘sensory perception’ point of view, which is a key concept of our design, both the ambient display and the tangible object.

**Discussion and Future Perspective**

Substantial information is not only to be found in such explicit information as words or texts. People sensorily feel it with their bodies. Krippendorff refers to Gibson’s ecological approach to perception that “The process of constructing the meaning relies on the human ability to act so as to change an existing sense to a preferred one” [12]. We suggest that the elderly person comes to understand implicit information in the empty space and distinguish the hidden meanings contained in it. What it comes down to is that the elderly person intuitively interprets what is of value for their purposes in their current environment and tries to become harmonious with it in everyday life activities. Contextual-emptiness does not mean communication-lack or nothingness. Rather, it indicates a condition that will likely be filled with the contextual cues they prefer. It activates users’ creativity and instils meaningful communication between them.

Our approach does not require users’ forcible reasoning to interpret information. By looking at an empty vessel, not as a negative state, but in terms of its capacity to be filled with contextual cues, the risk of a reality gap will be reduced. The sharing of meaning, usually restricted or concealed because of limited capacity of conveying explicit information, will be released. We need to experiment to investigate how the sources of contextual cues are suited for the situations in the sharing of meaning through mediated communication within emergent virtual/physical space, so that they make possible a natural flow of action without being distracting. That means the contextual reality gap has been effectively bridged. However, critical issues have arisen through the present practice. We believe user observation is important for design. But, since we cannot observe others’ senses, we have no direct access to the meanings they construct and no direct way of knowing why they see the world as they do [12]. The gap between designer and user is, in most cases, a product of this issue. We need to carefully conduct our forthcoming focus group studies based on considerations of this issue.

Many disciplines have used the term context-sensitive or context-aware interactive systems. It is, in our view, to explore strategies and methods of how contexts are composed, how contexts are structured, and how contexts are described in a way to maximize whole system performance. The present paper attempts to explore how the contextual reality gap can be bridged effectively in the sharing of meaning through mediated communication within Blended Reality Space. This is a more human aspect of design, more human scale. It is vitally important to pursue innovation that originates in the pursuit of the senses. It is the pursuit of human senses to evoke the
animating force of innovation with scientific progress. Unlike the nature of developing “synthetic knowledge” often constructed by modern internet users, whoever they are and wherever they may be in the world [6], we need to reconsider the complexity and profundity of information and communication quality perceived with active use of our senses. Our approach is the creation, manipulation, and sharing of meaning through interaction nicely employed within blended reality space. The appropriate combination between action and meaning is about the relationship between tangibility and evoked presence, which are incorporated into a practice [7].

Recently, in the field of design, profound research into sensory perception has been carried out, allowing for the establishment of a new disciplinary field merged with, for example, cognitive science, presence research, neuroscience, and Information and communication technology. There will come into existence a new innovation opportunity integrating ‘tangible presence’, with ‘design’ and ‘science’.

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References


Technology supporting the everyday life of people with dementia

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Abstract
People with dementia have increased needs for support when carrying out everyday tasks. Even mild forms of dementia are associated with a diminished quality of life, poor self-esteem, anxiety, and social isolation. Whereas in the past, technology research has largely focused on ensuring safety and security of dementia patients, the focus is increasingly on positively enhancing the quality of life of dementia patients living at home. More recent work, therefore, has adopted a needs-led approach to ensure that interactive devices are more usable and relevant to dementia patients. In line with this, the aim of the present study was to develop design concepts for technology supporting people with dementia in their independent living, based on interviews about the needs of users and their carers. The results show the need for both independence and social interaction as the main concern. From the carers’ point of view, technology for supporting social interaction is also seen as a major domain that technology development should focus on. A review of current research, the findings of our interview study, and resulting design scenarios are presented in this paper.

Keywords
Dementia, Inclusive design, Independent living, Social interaction.

Introduction
Dementia is a condition in which the way the brain functions is gradually lost. People usually think of it as being memory loss, but in fact dementia affects more than just memory. It affects the ability to use words and to carry out previously familiar tasks, like getting dressed or making a cup of tea. It affects recognition of places, people and objects, and people with dementia often feel lost in terms of time and place.

People with dementia have increased needs for support when carrying out everyday tasks. Even mild forms of dementia are associated with a diminished quality of life, poor self esteem, anxiety, and social isolation [1]. A number of studies have been looking into designing technology for people with dementia living at home. Whereas in the past,
research has largely focused on ensuring safety and security of the patients, mainly by providing alarm systems and barriers (e.g. against wandering about). Often, the focus has been on surveillance systems that can alert family, carers and medical staff if things go wrong. Increasingly, the focus is on positively enhancing the quality of life of dementia patients living at home, because surveillance and blocking off people from doing what they want to do raises ethical questions and does not receive much enthusiasm from patients [2,3]. More recent work has adopted a needs-led approach to ensure that interactive devices are more usable and relevant to dementia patients [4].

In a larger study that consisted of interviews and focus groups with carers and people with dementia, Wherton and Monk [1] derived several areas of daily living where designing supportive technology could help to maintain an independent lifestyle. This included daily activities like dressing, medication, eating and drinking, washing, toileting as well as domestic tasks like washing-up, locking-up, ironing, and cleaning. There was the area of risk mitigation, especially related to cooker safety and wandering. Leisure often consisted in watching television and was generally characterised by a loss of interest. Finally the large area of interpersonal interactions was identified as an area where technology could be useful. This included face-to-face and telephone conversations, keeping appointments, or help with recognising people.

The deficits in cognitive functioning underlying these problem areas are difficulties in sequencing actions (e.g. initiating actions, ordering actions and formulating procedures), learning (of new appliances and surroundings), memory and orientation (e.g. forgetting events, forgetting to do things, orienting in time and place, recognising people). The consequences of these deficits were identified to affect safety, security and health, but also the perceived well-being, stress, and social isolation of the people who suffer from dementia. The consequences for their caregivers are a heightened demand on supervision, worries and anxiety, but also a growing sense of frustration.

The challenge of designing technology for people with dementia is connected with the syndrome and the progressive worsening of cognitive functioning. Also, a crucial feature of dementia is that the recent memories and skills are the ones that are damaged or lost. Thus, people will have difficulty learning new technology and they will even gradually lose the ability to operate familiar devices, if they are too complex to use. One possibility is to make new technology look very familiar to what people already know or to attach it to already familiar items in their daily routines. New technology should be very simple to use, ideally have only one control, have clearly discernable controls with regard to their size and the surrounding visual clutter, feedback needs to be immediate and without delay, and direct interaction via touch-screen seems to be preferable [1,4,5].

As design for people with dementia can therefore be very challenging, our research tries to avoid introducing new technology to people with dementia. It rather focuses on designing devices that support older adults in their daily living before they get dementia. We think that such technologies gradually weave into everyday routines while the adults are healthy, so that the use of technology is already familiar when the first signs of
dementia set in. These devices then will continue to support the daily living of people with dementia – hopefully in a better way than current technology can.

To explore this idea a bit further, we conducted interviews with people with dementia and their carers on several domains of daily living. This resulted in some overarching themes that were used to develop design scenarios in which new forms of technology are explored that follow our general approach.

**Interview study**

**Method**

In order to find out more about the needs of people with dementia, an interview study was conducted at a British day centre that has a capacity for 15 people with dementia. Eight people from 76 to 86 years in an early to moderate state of dementia were interviewed (Table1). Six of them live on their own, one person lives with his spouse and another person lives in her own flat in a home for elderly people with a common room and care staff. In addition, two members of the day centre staff were asked about their ideas on technology supporting people with dementia in their independent living.

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The interviews with the people with dementia lasted between 30 and 70 minutes. The interview was semi-structured and covered several areas of daily living partly inspired by Wherton and Monk [1] and Sixsmith et al. [6]: Listening to music, social participation, community relationships, outdoor activities, household tasks, exercise, leisure activities, daily routines as well as the current and desired use of technology. The interviews were recorded with a voice recorder, transcribed and analysed to identify common themes across participants.

**Results**

One of the strongest findings was the need for independent living: “if I could I would be independent” (P1), “I like my independence because I think that’s the most important thing for anyone, you know. I don’t want to do that one, do that, eat that, or drink that. No.” (P4). Although this need for independence is felt quite strongly by almost everyone we interviewed, their (physical) illnesses make it necessary that other people provide help. This could be help with washing and cleaning, preparing meals or doing the shopping. Help sometimes was provided by professional carers or relatives. Being dependent on others therefore feels, to some of the participants, that they were a burden to others: “Yes, they [the carers] do everything, but I don’t want to be a burden. I am very
independent, I don't want to be a burden…if I could I would be independent. Don't ask anybody to help” (P1). Others are quite comfortable asking people for little favours. P5 who lives in the care home: “If I need anything. Say for instance I need buns, I'll say ‘Well I need some buns can one of you…’ They’ll say ‘Alright’.

Many participants retained responsibility for some small tasks like doing some shopping, walking the dog, preparing their meals, tidying up, etc. and that felt very important to them. It turned out that the urban environment is very good at supporting these tasks where shops, parks, the doctor’s, and the barber are near where people live, where the streets and the people are familiar. To have everything nearby is very helpful, because forgetting to buy something in the shop, for example, is not penalised highly. It can be easily made good the next day.

After the desire for independent living, the second largest area of concern was social interaction. This became obvious during the parts of the interview in which social interaction was the main topic of the conversation. But it also became apparent that many of the other topics of daily living had a significant social component. Social interaction always was interweaved with other activities and sometimes provided the only reason to engage in activities. For instance walking: there is the man (P6) who almost daily walks to The Regent’s Park. He knows some people there, “one gets to know them, I have a little bit of chat and all that with them” The people he meets remember his name and greet him, they are very friendly, he likes it. There is the woman (P2) who goes to the Bingo hall twice a week, because there she can meet people of her age. “I’ll speak to anybody. I mean if somebody comes and sits down next to me then I’ll… have.. a bit of a chat or something. Especially elderly people as well like myself you know”. And of course, one of the main reasons to go to the Day care centre for many is to see new people and have a chat.

The topic of music is very important to people with dementia, but it also is often connected to social events: listening to music and singing at the day centre, hearing Irish music at the Bingo hall where one can meet friends, etc. Although P2, for example, has a radio that she can easily operate, the music available at other places draws her to go out and see other people – especially if it is good old music from the past.

Satisfying social interaction is often superficial. A quick chat, a greeting, even waving at passers-by when sitting near the street are enough to make the day. Satisfying social interaction is often passive. S2 reports: “There is one lady who is Portuguese but she always requests Molly Malone the Irish song, which isn’t something I would image she knew when she was younger but because other people like it she likes seeing them enjoy it. […] maybe that is easier for her…Rather than singing it watching other people enjoy it.” Very often we heard from participants that they liked to receive phone calls, although they rarely take the initiative to phone others. It is not clear, why they would not take initiative. One thing is that initiative is slowly waning with the progression of dementia. Another is that they do not want to be a burden. One women asked why she did not phone her children, said that they had their own lives, their jobs and families, and she did not want to disturb them. She rather waited for them to call. The carers believe
that at least a few of the people with dementia are a little ashamed of their disease and are also afraid to lose track in the conversation.

A big issue in social interactions was trust. Knowing about their vulnerability, sometimes out of bad experience, participants were careful not to trust strangers too much. They were wary of constantly changing carers that came to their home. One man (P6) even decided to go to the Health Centre every day to get the pills himself rather than to let the carers bring them to his home, because “then anybody could come”. He felt that he couldn’t trust the people; going to the Health Centre he retains control and knows what is happening. Another man (P3), who lived alone, often goes to the pub around the corner. He says that he knows all the people there, that the barman introduces him to new people, and that he trusts the barman. But otherwise he is very careful to not go out alone. He thinks it is too dangerous.

A rather sad finding is that the people with dementia lose many opportunities for social interaction over time. That is the case when neighbours and acquaintances pass away or move into care homes. That is also the case when they themselves move into a care home. Entertainment venues may close. Children have their own families and lives and therefore not enough time to be available all the time. Because of the issues of trust, but also due to their illness that reduces the ability to recognise people or that reduces the ability to take initiative, they do not get to know new people. This can result also in great loneliness. For instance, P8 reports that she is not satisfied with the care she gets from her son. Her son would pick a programme on the TV, then he goes out with his mates and “leaves her there with nothing, looking at the ceiling”. Her other relatives are in Scotland but “they don’t come down for holidays” to visit her. She has no other friends: “Nowhere to go unless you made friends and I’ve never made friends’. Again, some of the people with dementia report they don’t want to be a burden to anyone. They are rather hesitant in calling family members because they don’t want to disturb them in their own daily life.

A third issue that did not pop up so automatically like independence and so pervasively like social interactions, but which we were very interested in, was the participant’s relation to technology and how they saw that technology could support an independent lifestyle as well as help fostering social relationships. It turned out that people with dementia rarely operate technology themselves. They find it too complicated to use. They say that they are confused when they don’t know which buttons to press (P3). Some switch their radio or TV only on and off and rarely change channels. Listening to CDs, for example, is very often not possible and someone else has to put the CD on for them. This seems to be a general pattern that was confirmed by the carers. The carers on behalf of the patients essentially operated each technology they tried at the day care centre, like applications for e-mail or chat or software for viewing photos. Only touch screens with single buttons would work at all. E-mail seemed to be too abstract and complicated, but there were early tests with Skype that went quite well, especially when the video picture of the other person was shown. The patients demanded bigger buttons on the phone, for example, and technology to be more easy to use in general. However, if asked if they would make more phone calls, if the technology was easier to use, the
people were not so sure. Sometimes they don’t see the value of using technology and they are afraid of doing something wrong. P5 for example does not even make tea herself “because sometimes it might spill and you’ll burn yourself.” Safety, of course, is another issue here.

**Summary and Discussion**

Of the many areas of daily living discussed in the interviews, the themes of independent living and social interaction were the most prevalent across participants. At the same time, the use of technology is very reduced to only single button presses, but most of technology use is delegated to other people. In addition, the progression of dementia makes it less likely to introduce new functions and new interaction paradigms to potential users of such devices. These findings are in line with previous research. Orpwood et al. [4] concluded that technology must be very simple to use and very obvious in its cause and effect relationships.

Our findings lead to the conclusion that a different approach is needed. So we were not looking for technologies that support the independent living for people with dementia but for the older adult who might in the future become a patient. This approach has several advantages. First, technology is introduced and learned while learning is still possible. Second, until the onset of dementia, devices have become familiar and the use of these devices has become automatic. Thus, technology can have a greater impact in supporting independent living of people with dementia early on.

In the following, we explore design scenarios and possible solutions that help older people staying or getting in contact with others and support independent living by new technology. As we have seen, from the carers’ point of view, technology for supporting social interaction is also seen as a major domain that technology development should focus on. We would like to keep the independence of people in their daily life, support them in keeping their existing social contacts and help them in establishing new relationships. We think that in developing new technology, we should focus on such a preventive perspective. That means giving support to people with dementia in an early state of their illness before they lose abilities due to their disease.

**Design Concepts**

In the present paper, we would like to suggest information and communication technologies (ICT) that can serve elderly citizens to sustain social relations and create new contacts before dementia is setting in. The overall goal is to maintain self-determined lifestyles in older age for as long as possible. We contribute to basic approaches for the prevention of dementia and thereby focus on older adults that still stay self-dependent in private homes but are regularly visited by caregivers. The design concepts are based on the theoretical and empirical findings reported above.

When searching for solutions to support people with dementia we took into account that once the disease started, it is mostly irreversible and will likely worsen. Hence as a point
of departure we would like to foster situations that help to lighten the decline in cognitive abilities. Hence the suggested scenarios aim at preventive activities, related to the still healthy elderly adult. The hope is that there is a better prognosis for people with dementia living independently, when a stable social situation with regular and interactive social activities is established and nurtured. This should be done while we don’t have to deal with the constraints of the symptoms of the later disease. Furthermore we take into account that continuing routines and daily schedules can support people to maintain independent lifestyles more easily.

As a result of our interviews we learned that close family members play a prominent role for the people as trusted persons. In a phase of life, when people become aware that they struggle with certain deficits, people should be able to purposely share certain tasks with the people they trust. We assume that facilitating technologies could serve to mediate these relations and in effect unburden patients and carers from omnipresent concern and responsibility issues (cf. scenario shared diary, below).

Many old people don’t expect technology to improve their situation due to missing experiences in the use and so will not find reasons to integrate it into their everyday life. Our main concern was not to simply add existing technology to a situation but to suggest a technology that allows to change a social setting by adding forms of communication that are mediated by technology. For that reason we examined how a meeting functionality inspired by today’s office software should be modified so that it can support elderly people to arrange face-to-face meetings (cf. scenario meet me, below)

Before rolling out the scenarios we want to introduce four personas that serve to transfer important characteristics of the conducted interviews and other results from research into more concrete images of possible users.

**Personas**

In order to detail our concepts, we initially had to summarise our understanding of prototypic living situations and typical users of the applications that we want to suggest. We decided to achieve this by creating a set of personas. Personas are archetypical characterisations that allow generalising assumptions about people for making the researchers’ expectations about the users explicit. Our personas focused on three groups that we regarded as most relevant for the understanding of our target group: family, friends and home-care workers.

**Paula** is 82 years old and still lives at home on her own. Her husband died ten years ago. Since then she lives alone in a small town about a two hour’s drive from London, where her daughter **Helen** is living. Paula got used to living alone. She managed her household and her social life on her own. Since a few months her daughter Helen has been realising that her mother’s memory got worse and many things became difficult that used not to be a problem before. At one weekend when Helen visited Paula, she realised funny smells because the dustbin had not been emptied. Suddenly Helen became aware that her mother is less and less able to complete daily tasks on her own.
At the same time she would definitely reject the idea to put Paula into an elderly care home, yet.

**Judith** is a friend of Paula’s. She is 80 years old and in a very similar situation as Paula. She lives alone in the same town. She likes to meet people but doesn’t find the reasons to contact others.

**Helen**, Paula’s daughter, is 48 years old. She lives a two-hour’s car drive away from her mother, together with her family of four. Helen works as a manager in London. She feels sad about the situation of her mother, but can’t afford to visit her more often than once a week due to her demanding job and her two little kids.

**Rob**, 32, is a professional carer. He visits the two old ladies and supports them with their everyday activities to better manage their households. Rob loves his job, but complains that he can’t spend the time he would like to spend with his clients. They always put a heavier demand on his time-budget than he can afford to manage.

**Scenarios**

**Shared Diary**
A few months ago Paula started to feel that she struggles with the daily tasks that she needs to complete. Once she forgot to take her medicine, twice she forgot to turn off the stove after cooking. Although she decided not to tell anybody, Rob obviously found out. Paula knows this as he has begun to take extra care to ask her whether she has taken her medication or whether she plans to cook something for dinner. The difficulty for Helen is to check if her mother is doing all right because of the long distance. After Helen’s daughter introduced the concept of a *shared diary* to her, she decided to introduce it to her mother.

The shared diary is a digital calendar that allows two (or more) collaborators to share daily task-lists based on a simple digital application. The lists are displayed on a screen that is positioned on a living room table to remain visible during the day. In our case Helen supports her mother in arranging a weekly plan that contains all necessary tasks to be done. At the same time Paula can use the shared calendar as well to add tasks for her daughter including things she needs from the city. Every task Paula ticks as ‘Done’ is also marked on Helen’s calendar and the other way round.

A shared diary should be based on individually made arrangements and mainly target people that are still able to consciously engage in this kind of collaboration and that are able to decide which activities they want to share. Besides, family relations it would also be promising to test the tool with two older participants who could take care of each other. In this case, uneven dependencies could be avoided and the mutual exchange between the two older adults is encouraged. The application should be implemented on a device with a touch-screen that should integrate into the living environment. It shouldn’t need to be activated in order to display the task lists permanently.
Meet me
Paula and Judith share the same passion: for many years they used to play Bingo in the local club. For them it means the perfect event to chat with each other and to meet various other friends and acquaintances. However, since a few years the number of participants is constantly decreasing. Sometimes their friends simply don’t show up for health reasons, sometimes they just miss the gathering because no one prompts them to make the move to the club. Paula and Judith assume, that there are more people, who could be interested in participating in the regular meetings, but both feel not able to find out when their friends go to the club They also wouldn't know how to contact these people and activate them to join in. Judith and Paula feel that this problem is not restricted to organising outings to the Bingo club, but could help with choir meetings and meetings in the pub as well.

»Meet Me« is a collaborative tool that allows people to set up meetings, receive feedback from invited participants and prompt others before an event starts. The idea of the tool is to enable people with no computer knowledge to organise meetings with a small number of participants in a local environment. The application thereby focuses on one single feature of regular office software but reduces this to very few functionalities and intuitive interactions that are easy to learn and self-explanatory. It offers a discreet way to contact a number of people while avoiding the accompanying organisational efforts (calling a number of people, taking notes, managing replies, etc.). The application appears with few buttons and simple textual output. It intentionally is not able to transfer language, video or text as people are used to talk on telephones and we would not want to shift these activities to other new devices. Input happens with simple touch gestures.

The main functionalities of the application involve:
• setting up and inviting people for a gathering,
• confirming and rejecting requests made by others,
• permanently displaying the current status of confirmed invitations, and
• receiving feedback messages about the status of the meeting.

Setting up meetings with the “Meet Me” application is done in three simple steps guided by simple questions:
1. Schedule meeting by setting time and location (When? Where?).
2. Invite others or everybody (Who?).
3. Send invitation to participants (Send).

When a meeting is initiated, all linked persons will receive an invitation that appears prominently on theirs screens. In the following, the initiator will receive a visual feedback if people send positive answers or rejections. All participants will permanently be reminded that they admitted to the meeting by text message that appears before the meeting takes place (“You want to meet Mrs Black today at 12pm at the X-ways shopping centre”). People will be alerted in case overlaps with other activities occur. Other stakeholders could also be involved in the use of the tool. Care workers, for example, who actively take part in scheduling and organising meetings among different participants.
By providing a restricted functionality and a simple visual design, the application is accessible for people that would otherwise be excluded due to the various requirements existing to set up and configure complex office tools or complex applications on smart mobile phones.

**Conclusion**

People with dementia have a very strong motivation to remain independent. Their biggest concern, in all fields of life, is about good social relationships and not feeling lonely. Technology does not play a big part in their lives, because it is complicated to use and mostly unfamiliar to them. These are the main results of our literature study and the interviews with patients and their carers. From these findings we conclude that new technology that is able to support people with dementia needs to be provided before the onset of the disease. Only then it is able to interweave with daily habits and existing social relationships and remains being helpful later on. The design scenarios *Shared diaries* and *Meet me* are the first steps in exploring this approach and we are going to follow this up in our future research.

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Influencing the Assistive Technology Marketplace

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Abstract
There is little dispute that the coming changes in the population age distribution in most developed nations will lead to increasing demand for assistive technologies. Currently the assistive technology market is immature with much of the market infrastructure missing or in its infancy. Inclusive design is one means of addressing the challenges of the assistive technology market by increasing the number of potential customers.

ATcare is a community interest company combining social objectives with commercial thinking to influence the market toward better quality assistive products that promote positive lifestyles. This is achieved by supporting innovation and assisting good new products to market. The company was established in response to a detailed analysis of the assistive technology environment and the company mission is to transform the lives of older and disabled consumers through the design, development and delivery of enhanced products and services. Projects undertaken by the company in the past two years reveal some of the challenges of the environment and some common problems with assistive technology development projects. These include failure to assess the real needs of users, failure to produce a feasible business plan, and the difficulty in establishing market channels.

Keywords
Assistive technology, business, market, design, product development

Introduction
This paper describes the business environment for new assistive technology products and how one company, ATcare CIC, has developed its approach to survival in the assistive technology marketplace. The role of inclusive design in assistive technology is described in relation to various models of disability and the unique characteristics of the market environment are described. Experience gained in over two years of operation is presented with an analysis of projects undertaken to date.

Assistive technology in society
Prior to the 1970s, assistive technology (AT) in Britain had traditionally been made available via a medicalised or individual-centred mechanism. A description of this mechanism might be that the individual’s physical or cognitive condition was considered to be something that might be “treated” via a health system, and the individual made
more "normal". If nothing further could be done medically then "aids" were prescribed to make daily living easier.

During the 1970s and in the 1980s a social movement originated amongst people with disabilities which propagated into the mainstream over time, especially in Britain [1]. This movement held that while individuals may possess physical or cognitive impairments, it was society that was the source of disablement through failure to be fully inclusive. Such a paradigm implies a redefinition of the meaning of words such as "impairment" and "disability", and was termed the "social" model of disability.

More recently the limitations of this model have been discussed in a number of academic papers [2] and a newer paradigm is evolving which breaks down the definition of disability. This “functional” mode of thinking holds that all people have limitations of one form or another and that normality and disability are misleading concepts. Where should one sensibly set boundaries to define what constitutes a disabled person relative to a non-disabled person? A person's physical and mental state is also dynamic and at some point nearly all people encounter limitations whether they be externally imposed or as a result of changes to their body or brain or environment.

Inclusive design sits naturally with this mode of thinking: Using design to remove barriers to the access of devices, systems, and the built environment. At the same time, fully inclusive design is an ideal that is not always achieved and there will always be a place for design that targets specific ends of the spectrum of ability. The term Assistive Technology has been criticised for having a poor fit with modern attitudes toward disability. Participants at a forum run by ATcare [3] commented that the term AT was "vague", "obscure" and had negative connotations. Others suggested that AT was about complex devices and advanced technology. Obviously a term is needed for discourse about products that address the specific needs of people on the extremes of the ability spectrum, and thus far no better term has been widely accepted.

In other spheres, such as policy making and legislation the functional view of disability is difficult to reconcile without a major rethink of existing law and policy documents. For example, how does one define criteria for entitlement to financial benefits and public services including provision of AT? Certain means of describing ability in functional terms now exist with the development of the WHO International Classification of Functioning Disability and Health (ICF) [4] and this may provide a tool for such purposes, however much legislation is still written in the language of the pre-1970s individual-centred world view. Currently the Fair Access to Care Services (FACS) criteria are used by local governments in Britain to assess people for graduated levels of funded care. Individuals are rated using a person-centred assessment based on needs identified collaboratively by the individual being assessed and the assessor. This moves the discussion on from a person's physical state toward a more holistic view of the individual's life, habits and individual way of living. The implementation of this system has however been criticised as unfair and open to variations across regions, and misinterpretation by professionals [5]. Recently the Common Assessment Framework for Adults (CAF) has been introduced to standardise assessment practise.

Today we live in an environment where all three models of disability in society co-exist somewhat uneasily. Government and Local body policy documents often contain elements of both an individual-centred and social perspective. The now-defunct Disability Rights Commission's role was passed to the Equality and Human Rights
Commission, who make frequent mention of the social model of disability. They have even broadened the scope of the social model into other spheres of concern such as racial and gender equality. At the same time the NHS and local bodies are the primary sources of AT products in Britain harking back to the individual-centred paradigm, and the word "prescription" is still used when providing AT.

One possible future for AT is the development of a larger and more competitive marketplace for private purchase of assistive products. This theoretically gives people with disabilities freedom to design their lifestyle by choosing freely from the products and services available. In practice consumer’s choice is limited at present and the high cost of certain AT products would disadvantage those with a higher level of need. Purchasers need to be supported financially which makes the marketplace necessarily artificial.

The previous government’s Putting People First Initiative [6, 7] aims to increase the number of people making use of direct payments, personal budgets, and individual budgets during the period 2008-2011. In this model local authorities make direct payments to individuals identified as having specific needs, who then spend the money largely at their discretion. This will lead to more people having direct control over their care service and product choices. The Transforming Community Equipment Strategy (TCES) is a new service delivery model that makes simple AT equipment available from retail outlets (primarily pharmacies) in line with this strategy [8]. The withdrawal of major pharmacy chains was a significant setback to the scheme, however the roll-out in selected localities commenced in August 2010 and the Department of Health’s national catalogue of equipment for independent daily living is available online [9].

Currently there are a few outlets for products specifically for people with disabilities, and some products available in mainstream stores. Assistive products tend to be expensive relative to comparable products for the general market, but there are several examples of products originally intended as assistive products becoming mainstreamed, such as easy-grip can openers, for example.

Overall the AT marketplace is in its infancy and there exist confounding influences that hinder its development. The transition to a market driven mode of AT acquisition will require a significant shift in the social landscape of AT, driven by a variety of factors including forecast changes in the age distribution of the population and hence the increased demand for assistive products, the availability of suitable products, and in generally held attitudes to disability.

The assistive technology marketplace

In 2006, NHS Innovations London began exploring a novel approach to AT. The Foundation for Assistive Technology (FAST) was commissioned to report on the barriers to market for new AT products. The report was completed in September 2007 and resulted in the proposal for the establishment of a company – ATcare – to support innovation in AT products and provide a pathway to market for good new products.

For the FAST report an expert panel with experience in AT product development was consulted, and various data concerning UK based AT research projects was assembled and analysed. An abridged version of the report is publically available [10].
The report revealed low efficiency in terms of research projects resulting in new commercially available AT products. Of the 362 projects analysed only 12 resulted in a commercially available product; 71 resulted in a product that did not make it to market by the end of the three-year study period, and 9 projects aiming for product development did not result in a product. Of the 362 projects, 267 did not aim for product development.

New government initiatives are intended to increase the emphasis on measurable benefit from research, which may alter the proportion of research projects without a product or service as an outcome [11].

Funding and resourcing problems were identified in conducting research projects within the NHS and Universities, especially at the initial proof-of-concept stages. Funding tracks are available but these are under-utilised, while funding body priorities are unpredictable and lack a long term perspective. Further barriers were presented by Universities’ lack of experience transitioning end-stage prototypes through to market ready products. The involvement of commercial interests was patchy and there exist tensions between commercial and academic approaches to development which need to be resolved such the handling of intellectual property and publication of results.

Products initiating from academic or NHS research then face further difficulties as do product developments that originate from private ventures. Little is known about the market for AT products making it difficult to estimate the impact of a new product in the marketplace and likely commercial returns. It is difficult to reach some populations of people with specific impairments and as a result many product developments are initiated with little more than the sketchiest assessment of real needs.

Statutory commissioning and purchase of assistive technology over the past 50 years has created an unnatural marketplace where private purchase is the exception even for products not eligible for statutory funding. AT purchasers are less likely to look outside statutory sources for products than consumers in other markets. It may be that a medicalised approach to AT provision has created a conservative culture amongst users of AT. Certainly there is low awareness amongst potential users of AT of what is available [12, 13]. Other consequences include the tendency of products to satisfy institutional rather than individual needs which manifests in over-designed components for durability, design for general use over customisation, an emphasis on products to support daily living (for example, bathing, dressing, toileting, and mobility in the home) over lifestyle products, and a favouring of low cost items over high-end products.

Manufacturers of new products must either develop their own market channels in largely uncharted territory, or satisfy the demands of statutory purchasers and the inherent limitations that imposes including the need to provide clinical evidence of efficacy. In other markets products tend to survive by consumer choice with less emphasis on rigorous clinical evidence. While it is no bad thing to accumulate evidence that a product works this is inappropriate for many classes of product where the consequence of failure is relatively minor, for example an eating implement that performs poorly will naturally be discarded and replaced with a more suitable one.

This private market for AT is in its infancy although some products are finding their way to the shelves of consumer outlets. This route is particularly suitable for products that do not require installation, support or training. For products that do require support after sale there is no precedent for delivering such support via channels such as supermarkets or retail chains. Current initiatives such as TCES do not address
installation, which is presumably left to the purchaser and their family. Statutory providers operate an assessment process which determines the suitability of a product for an individual. An open AT market will rely on self assessment of suitability and manufacturers must account for the possibility of inappropriate use of their product. Human nature may lead to the use of AT in ways that have negative social impact in much the same way that automobiles and high-fat foods have had.

Supporting innovation

In order to affect change in the AT marketplace, thought leadership is required to stimulate innovation and lead the market toward higher quality products designed with better understanding of the needs of product users. Products should support positive lifestyles as well as activities of daily living, and they should encompass aesthetic as well as functional values. ATcare was established to encapsulate these values while supporting innovation in AT products, and providing a route to market for new products. The company received seed funding from the London Development Agency in order to become established with the eventual aim that the company would become self-supporting from the proceeds of product sales and royalties. In the process of becoming established the company has evolved to address a somewhat different set of challenges and has structured itself accordingly. Originally established simply as a private company limited by shares, ATcare changed its status in 2010 to a Community Interest Company (CIC) which remains limited by shares. As a CIC, the company is required to re-invest most of its profits to benefit the community.

In the process of taking its first projects to market the company has encountered many of the difficulties described by the FAST report. ATcare has had to work hard developing market channels and create its business models in a vacuum of prior experience. Support from public funding sources including Social Investment Business and the London Development Agency has allowed the company to continue when purely commercial enterprises would most likely have failed. Currently the company is working to secure revenue from its flagship products to achieve independent financial sustainability and use this to invest in the company’s broader objectives.

Currently ATcare engages in a mixture of publically and privately funded research and development, and consulting work involving user testing of products and facilitating user involvement in design. The company regularly receives approaches from individuals and companies with new assistive product ideas. New ideas are evaluated, developed, and commercialised using a staged process described below.

ATcare have established a commercial arm which trades under the moniker “Being”. This company will eventually market a range of products, some developed by ATcare, others from third party suppliers. Currently it markets ATcare’s two flagship products: Being Alert and Being Music Player, both intended for the dementia market sector.

**Being Alert** is a system designed to maximise freedom of movement for residents of dementia care homes. Incidents of residents leaving care facilities and becoming lost are rare although potentially catastrophic for residents and staff. It is a scalable electronic alerting system worn by residents and staff. The complexity of an installation may vary with the complexity of the social and physical environment in which it is installed and
often it is social factors which most strongly affect the design of the installation. Installations are designed in a consultative manner with input from all parties concerned about factors such as how the transmitter is to be carried or worn, what situations should trigger an alert, and how the system may evolve over time as each individual's condition changes.

The **Being Music Player** is a consumer product optimised for people with dementia. It is widely accepted that music has beneficial effects for people with dementia [14] however most modern music playing devices are feature rich and present a confusing array of controls to the user. In order to preserve the ability to access music independently as long as possible the Being Music Player is designed to present the minimal feature set and the most intuitive user interface possible.

The music player features a lid which activates the player when opened, revealing a single button which advances the player to the next track in a random sequence. The device has three slots for memory sticks containing music in MP3 format.

Originating from studies investigating the needs of people with dementia [15, 16], the Bath Institute of Medical Engineering developed and tested prototype devices with funding from the Helen Hamlyn trust [17]. ATcare then adopted the results of this work as the starting point for the development of a commercial product.

**Development process**

New ideas for assistive products are frequently presented to ATcare. The company has developed a systematic process for evaluating new product ideas and providing feedback and guidance. Ideas that show potential and which fit with the company's strategy and available resources are adopted and enter the six-stage development cycle:

1. New ideas are given a brief analysis and the inventor is given feedback.
2. Ideas that show potential are given a thorough analysis and a business and engineering case is prepared. Consultation with users is carried out at this stage.
3. The design stage where project concepts are embodied.
4. Prototyping and testing. User testing and feedback is an essential requirement for all product developments.
5. Production design and manufacture
6. Project completion and market launch via Being.

**Analysis of projects**

At the date of this writing a total of 64 projects have been put through the staged development process. The following analysis illustrates common themes encountered in many proposed products.

**Project originators**

The majority of projects have arisen from the commercial sector (37). This sector can be broken down further into “lone inventor” enterprises (16), and those originating from registered companies (21). Also significant are academic projects. A handful of projects from both the commercial and academic sector has originated as student projects. Figure 1 illustrates the proportion of projects falling under each category.
Figure 1 Source of projects presented to ATcare for evaluation. Each square represents an individual project.

Figure 2 Projects categorised into broad themes.

Figure 3 Breakdown of projects by stage. Terminated projects are marked with a cross. Terminated projects at stage 6 are successfully complete.

Figure 4 Reasons for termination of projects.
Project theme
Figure 2 shows the projects grouped according to primary theme. Quite a few of the projects (20) targeted mobility, either wheeled or ambulatory. Overall the projects were spread between sensory disability (13), physical disability including mobility (27) and cognitive disability (10). Projects proposing new devices totalled 43 while 14 proposed new services. Therapeutic devices were the target of 7 projects while 7 projects aimed to provide new information or education services. Eight projects targeted activities of daily living (ADL). Six projects were telehealth related while projects making use of the internet including telehealth totalled 12.

Project attrition and cause
The majority of projects do not continue through to market for various reasons. Figure 3 shows the status of 64 projects at the time of writing. Those that are discontinued are marked with a cross. Reasons for discontinuing projects are summarised in Figure 4. Many projects were regarded as not feasible for technical reasons, a flawed business case, too much competition in the market, or problems with users’ response to the idea. Other significant reasons for discontinuation include ATcare being unable to contribute usefully to the project for various reasons, poor fit with ATcare’s business strategy, and client withdrawal for various reasons. Projects discontinued at stage 6 are successfully complete.

Design methodology
Of all 64 projects, 11 could be described as inclusive design and 45 could be described as targeting specific disabilities. Only 6 were “user driven” in that the design goals were significantly influenced by people with disabilities. Conversely 54 projects were “inventor driven” in that the design goals were largely the result of the (non-disabled) inventor’s research and experiences.

At the time the projects were presented to ATcare, 21 had made an assessment of user needs, including 4 out of 6 of the user driven projects. Seventeen of the projects had investigated their intellectual property position and 18 had considered relevant regulatory issues. The majority of these latter two groups were corporate inventors (13/17 for intellectual property and 15/18 for regulatory).

Avoiding failure
Experience gained so far demonstrates the strong advantages of including people who will eventually become users of the new technology or service from the earliest stages of conceptual design, through testing of prototypes, and beyond into the marketing phase. Equally it is important to have a business case early on that quantifies basic information such as market size and potential market channels, competing products, and intellectual property and regulatory issues. The business case should be refined throughout the development process as new information and feedback is acquired. It is far better to have a list of specific sales channels with estimated unit sales than a bulk estimate of market size and penetration.

Securing patent protection is costly and not always necessary depending on a number of factors, so it is advisable to seek advice on the utility of intellectual property protection.
with respect to the product and business plan. Sometimes secrecy and a properly worded non-disclosure agreement are sufficient at the development stage.

It is difficult to be commercially successful if the user base is small and difficult to reach so maximising inclusiveness is worthwhile if this is possible. There exists very little marketing information concerning people with disabilities however even a small amount of market intelligence is better than none. Selling product to statutory providers such as local councils and the NHS can take time and resource and small enterprises face a low probability of success.

The major indicators for success are products that address real needs effectively, which are aesthetically pleasing, and which can be sold directly to a customer base for whom effective communication channels exist. A business plan which includes the best information available and which is realistic about levels of sales is still the most effective tool to decide whether a project is viable, as with any commercial project.

Conclusion

The establishment of a vibrant and thriving AT market is an important factor in preparing to address the coming increase in demand for AT resulting from changes in society. These changes include not only the forecast increase in the proportion of older people in society, but greater expectations of quality of life for people entering older age and also increased longevity of people with disabilities.

The establishment of an AT market is unlikely to happen without the influence of organisations and individuals purposely leading the market. Financial support is essential in the short to medium term to enable enterprises to overcome the challenges presented by the current state of the market. The market is under-developed and subject to influences that constrain and sometimes confound natural competition.

ATcare has achieved the introduction of its first products to market with the aid of social investment. The challenge now is long term stability and profitability to enable further activity influencing the social and commercial environment.

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Session 3C
Theorising Practice
The role of flow experience in co-designing open-design assistive devices

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Abstract
This paper describes the theoretical framework of an inclusive participatory design approach which leads to qualitative occupational experiences within the field of community-based rehabilitation. The aim is to support voluntarily controlled activities by applying co-construction theories to disabled users and their dynamic environment. The starting point of this open design process is a threefold interaction involving caregivers, patients and occupational therapists within their local product ecology. Co-creation is used as a set of iterative techniques to steer the patient towards flow experiences. Do-it-Yourself is consecutively applied as physical prototyping, communication language and personal manufacturing process. By implementing this active engagement process disabled people and their carers become conscious actors in providing collaborative maintenance of their own physical, mental and social well-being.

Keywords
co-construction, product ecology, flow experience, assistive technology, co-creation, open design, do-it-yourself, cybernetics

Introduction
Social policy has been evolving recently towards a broader focus on sharing and understanding the wicked aspects (Rittel et al, 1973) within social healthcare contexts. The World Health Organization recognizes disability as “a complex interaction between features of a person’s body and the features of the environment and society in which he or she lives.” (ICF, 2001). Many stakeholders at different levels are involved and changing social dynamics make these interactions even harder to grasp and design for. These phenomena manifest themselves in the amount of assistive devices that hardly find their way to disabled users and if so, the usefulness of these products in the field is
rather low. Each disabled individual requires another approach in order to reach the goals based on his or her personal skills. On top of that each person will carry out other activities driven by their social context and direct environment. Regarding inclusive design, excellent work was already done in the past. Generally the emphasis was put on providing cost-efficient aids and finding a certain stage of consensus which homogenizes abilities. Nevertheless, in practice this view conflicts with personalized care provision in the world of disabilities.

There is another growing trend of framing health in terms of well-being up to and including self-management (Dubberly et al, 2010). The largest healthcare provider in many nations is not the national healthcare system but the local family (Arno et al, 1997). The key issue will not be the provision of more doctors and nurses, needed though they may be, but how effectively people are engaged in the responsible, collaborative maintenance of their own health (Leadbeater et al, 2004). This self-management perspective pitchforks disabled people and their caregivers into a job as designers/therapists, which makes them more conscious of their task to build their own adaptive assistive devices. These pragmatic activities argue for a new design approach which we call co-construction (Evenson et al 2010) since relationships between care appliances, disabled people and caregivers lies at its heart.

‘Design for (every)one’ is an multidisciplinary education program which conducts participatory action research (Brydon-Miller et al, 2003) and implements open-design principles within disability contexts. Based on frameworks of sociology, cybernetics, occupational science and positive psychology, a co-creation process for open design assistive devices has been derived to augment the quality of occupational experiences. The aim of this paper is to describe the theoretical framework of this inclusive participatory design approach.

**Design for flow**

Occupational therapy is as a profession concerned with promoting health and well-being through occupation (WFOT, 2004). As mentioned before, the relationship between our health and what we do is complex. Many people may be able to identify occupations that make them feel good and others that make them feel bad. A deeper understanding of how and why occupations impact on well-being will enable designers and occupational therapist to design better affective, assistive devices and provide more efficient services. One of the most surprising findings in positive psychology is the great effect of voluntary controlled activities on one’s happiness (Lyubomirsky, 2007). These findings are used to build a well-being design strategy within the field of occupational therapy.
Within occupational science there is a distinction between activity and occupation. The comprehensive model of occupation (CMO, 2010) consists out of three factors that have impact on a well-balanced occupation: the individual himself, his activity capital and the surrounding habitat which in closes both social and physical capital aspects (Figure 1). The model displays a holistic overview of the dynamic variables but it doesn’t give stakeholders a notion of the quality of the occupational experience. A psychological construct that may help to unravel the relation between occupation and health is flow (Csíkszentmihályi, 1990). In his work 'Flow: The Psychology of Optimal Experience', Csíkszentmihályi outlines his theory that people are most happy when they are in a mental state of being completely involved in an activity for their own sake. Several studies associate flow with an increased level of happiness, self-esteem, work productivity and joy of life. Csikszentmihalyi developed a series of theories to help people to get into their flow state. Since then, these theories have been applied to various fields for designing better interactive experiences.

Of course we can’t design experience as such because experiencing is in people. But according to the CMO model designers can still vary the surroundings or the activity as these are both instigators of well-being behaviour. Designers carry out the mechanisms and conditions of flow in the prescribed way when co-designing personal assistive devices with disabled people and their caregivers.

**The framework : Co-construction**

Designing for one specific user is not new...in fact it is the oldest tailor-made approach we know. However, every single individual problem is connected with individual conflicts of values, goals, skills and specific interests. Thus: if one wants to design meaningful assistive devices, one should take into account the whole product ecology (Forlizzi, 2008) of an individual context. This theoretical framework is based on social ecology theory which focuses simultaneously on the environment and the social relationships among the people within it. It maps all the elements around a disabled user and it examines the broken factors apart from each other and altogether (Figure 2). Within this...
organic system, the underlying assumption is that human behavior can be understood as an adaptive fit to an external environment (Netting, 1986).

The concept of human adaptation as such is the iterative process whereby an individual becomes better suited to its habitat (Bowler, 2003). We could see this process as a meta activity within the context of design for (dis)ability. In a broad sense, biological co-evolution is “the change of a biological object triggered by the change of a related object”. Co-construction (Oudshoorn, et al 2003) examines the product as instigator of change- how it has an effect on people, place and other products in us, effecting dynamic change on all the factors in the product ecology (Forlizzi, 2008). Subtle adaptations can provoke a lot of negative or positive emotions and steer our behavior implicitly towards several product experiences.

Co-construction (Oudshoorn, et al 2003) is a social process in which people and objects and their relationships influence each other and impact upon potential outcomes. The concept is used to identify a form of participatory design. By means of a set of iterative techniques and approaches, co-construction puts users and stakeholders at its heart. While users and stakeholders work from their perspectives, co-construction engages latent perceptions and emotional responses from them to products and services.

In combination with physical prototypes (made by local resources) it becomes a tangible pragmatic tool which continuously shifts between “what is needed?” and “what can be
build?” in order to achieve a qualitative occupational experience (Figure 3). This polarity gives a sound basis for this ‘design for (dis)ability’ approach (De Couvreur et al, 2010).

The process: Adaptability loop

The adaptability loop (Haeckel, 1999) is derived from the classical PDCA quality cycle (Shewart, 1939) build around the key aspects of occupational science. Haeckel proposed this process for coping with changing environments. At first, it appears to be a classic feedback-based control loop based on sense-and-respond. But the options for action include the possibility of changing goals, which is one of the fundamentals in daily rehabilitation programs. Another crucial aspect is the look at this model from a double-loop learning perspective (Figure 4). Unlike single loops, this model includes a shift in understanding, from simple and static to broader and more dynamic, such as taking into account the changes within the product ecology.

Mental models derived from the flow construct are extended and validated through co-creation of new explicit mockups. By slowly adapting the user to his assistive device and vice versa, we want to steer the patient literally towards a flow experience within his voluntary activity. The product experience is measured by logging the affective responses that are experienced in the user-product interaction (Desmet et al, 2007). Verbal and non-verbal behavior is mapped on the mental state model (Figure 5). Csikszentmihalyi identifies "skills" and "challenges" as the two key variables in the flow experience, placing them on the respective X and Y axes of this graph. He describes occupational emotions as the relationship between the perceived challenges of the task at hand and someone’s perceived skills. Pointing out the position of the client enables designers and occupational therapists to discuss the focus of the next adaptation strategy. It guides the decision making process into new concrete actions.
Both axes can be manipulated from occupational expertise and designer expertise. Practically, when an occupational experience leads to anxiety, the co-creation team can undertake two types of action. The first action could be to vary the characteristics of the challenge. Occupational therapists can break down activities into achievable components or they can teach new ways of approaching tasks. Within this activity-centered design (ACD) approach, activity analysis is an often applied technique. It is defined as a process of dissecting an activity into its component parts and a task sequence. It allows people to identify inherent properties and skills required for its performance.

A second type of action can be found on the horizontal axes. It rests on augmenting the skills and ability of the patient through human centered design (HCD). This can be achieved through environmental adaptation within the product ecology, including provision of equipment or designing adaptations to remove obstacles or make them manageable. Factors like persons can also be taken into account through guidance of family members and caregivers.

The aim of this process is to co-create a clear view on the occupational experiences and to build a shared dialogic language which is build on physical manifestation of emotions. In reality there is no ideal standard approach. Design for flow switches constantly from ACD to HCD and vice versa. The main aim is to build through co-construction a stage of homeostasis between environment and user. HCD asserts as a tenet that technology adapts to the person. In ACD, we admit that much of human behavior can be thought of as an adaptation to the powers and limitations of technology (Norman, 2005). Adapting technology to users increases the costs. Adapting users to technology takes time. Every individual has its own constraints and possibilities, physically or mentally. These will influence a person’s capability of executing his activities and tasks. Through ACD techniques we translate these into functions and properties. We look for matching resources and try to adapt them (HCD) to the context of the patient. This pragmatic process can be run in a number of iterations. Every cycle we gain more insights on both levels. The point of ideality, where high challenges and skills meet, will rarely be reached. Users are moving targets within dynamic environments. What you design for the user today could be wrong tomorrow. This emphasizes the need for a new product language which is highly adaptable and sustainable.
The medium: DIY as co-creation language.

More and more rapid live projects within healthcare contexts are running in order to develop new thinking and practical design solutions in the form of systems, services and products (Leadbeater et al, 2004). Based on wicked problem theory, understanding can only come from creating possible solutions and building knowledge through validating specific solutions with individual users. The role of the mockup or prototype is instrumental. It creates a shared language between all the stakeholders by converting their expertise and needs into product properties. If we want to design qualitative occupational experiences within this dynamic setting, we have to build upon knowledge and skill acquisition from all stakeholders simultaneously and on the spot. In terms of assistive devices this process is already implemented on a daily basis by caregivers, occupational therapists and even disabled people around the world.

A nice reference to illustrate this phenomenon is “instructables.com”, which is a web-based DIY documentation platform where passionate people share what they do and how they do it, and learn from and collaborate with others. If we look at the category “health”, we find numerous of disruptive assistive devices adapted to personal settings. All these projects can be considered as small co-creation projects between caregivers and their disabled relatives. Compared to standard assistive devices, the degree of usefulness of these projects is high, due to the right balance between user, environment and activity. The DIY approach empowers people to validate their assistive devices through co-creation with the surrounding product ecology and with the local resources and skills available.

Recently the two phenomena have been compared (Hoftijzer, 2009) which leads us to some remarkable parallels and conclusions. Co-creation could very well be regarded as a new type of DIY, adapted to modern times. Physical prototypes being part of a professional language can help designers and occupational therapists to better understand the complexity of an assistive design (Schön, 1983). They offer a tangible
physical summary of the knowledge related to all involved aspects (manufacturing aspect, design aspect, interaction aspect,...). They even give a designer the opportunity to solve several problems in less design iterations (Figure 6). The result is an open design process which leads to a personalized manufactured product. This scenario of assistive devices even includes self-repairing and recycling of local resources. Designers will no longer only design for people. They will have to learn to design with people. Cheap and powerful prototyping tools combined with physical hacking principles can turn non-engineers into self manufacturers. Professionalize DIY towards open design could be the first step to bridge this gap.

CONCLUSION

Although this framework has been partly validated through several small case studies (figure 7), a lot of research still needs to be done. It aims to extend design culture within the field of occupational therapy by providing a roadmap for choosing appropriate and qualitative research methods which can be used by non-designers. The shift from product to experience is already strongly embedded within current design culture, but for caregivers and occupational therapists it opens out a new way to look at their problems in the field.

Figure 7. design for (every)one case studies

The process tries not being prescriptive. It rather attempts to build on the use of local implicit knowledge. This participatory design method allows participants to understand the experience domain of the patient within his or her product ecology. The array of
gained user data explores three perspectives (Sanders, 2001) simultaneously: what people say (evaluate) and what they make (design) and what people do (implement). They try to sketch a clearer view on the phenomena that contribute to wicked problems in healthcare. The results prove the fact that people are disabled by the context they live in and not directly by their impairment or shortcoming. Just as design can disable, it can also enable people to manage their well-being in a self-organising sustainable way.

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Bridging Methodological Gaps Through Cross-Disciplinary Dialogue for Design of Smart Clothes and Wearable Technology for the Active Ageing

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Abstract

This paper will consider the implications of a cross disciplinary approach to socially innovative design processes by examining research work in progress within the ‘Design For Ageing Well – Improving the quality of life for the ageing population using a technology enabled garment system’ project lead by University of Wales Newport. Social innovation often manifests through the actions of motivated individuals striving to improve the quality of life of themselves or other orbitally linked persons or groups. Within this paradigm, change frequently occurs organically with facilitators reacting to emerging advances in design theory and practice, appending each discovery to their own creative toolbox to help catalyse their next move. Whilst this practice has been proven as a successful methodology, it can lack a strong underpinning, i.e., a firm research grounding, of user focussed strategic direction with the consequence that product outputs with the potential for socially beneficial impact can fall short of the initially visualised potential. The Design for Ageing Well project aims to bring the relatively new discipline of smart clothes and wearable technology to the active ageing and provides a good case study through which to examine these issues.

Keywords
Social innovation, design methodology, design theory, smart clothes, cross-disciplinary, active ageing.
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” (WHO, 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. Its interesting to consider that writing today, 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% mange to undertake the recommended level of weekly exercise (ONS, 2010).

Hardy (2008) argues that beliefs and attitudes about health are “complex, inconsistent, dynamic and fragmentary”, with general perceptions about health in later life revolving round ideas of being physically fit, having a lack of illness, and being functionally fit and able to cope with normal day to day activities. This is subject to individual judgement which is of course relative to the current point in life and personal expectations – Individuals will consider themselves in good health if they feel that that others have more problems, many of which can be manifested in many ways: “she has no friends”, “he has problems walking”. (Ryan, 2010)

One in three people over 65 falls over each year, many suffer from a resulting hip fracture and half of those never regain full function again. Regardless of their age one in five of these over 65s dies within 3 months as a result of the fracture, with problems usually related to osteoporosis (Ryan, 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 the Design for Ageing Well project 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.

Merging of methodologies

Different views

It is the belief of the research team that for the project to be successful, it is important that the real needs of end user, the participants in the Active Ageing demographic, are integrated effectively into the process and the outcomes represent what the participants need and want from a smart clothing system.

This could be seen to challenge the established norm in the fashion / apparel industry, where the accepted approach to apparel design and production is typically trend prediction, style and production system led, with little room for real involvement of the end user – the customer. The apparel design and production process has been researched by Hussey (2007), her findings demonstrate that there is very little space in the process for real integration of end user needs or the concept of co-opting the user into the design process, as summarised in figure 1.

![Figure 1: Interrelationships between fashion/design and clothing manufacture (Hussey, 2007)](image-url)
In the model identified by Hussey, “customer requirements” is taken as the requirements of the brand or retailer, rather than the end user. This is also well demonstrated by Mkelvey and Munslow (2003), in their discussion to explain the design process.

A different culture however does exist in some specialist vertical markets, for example in the outdoor clothing sector of the apparel industry, where many of the most successful players were gestated from the specialist needs of the founders (examples in the UK would include Mountain Equipment, Paramo, RAB, and in North America, Patagonia, The North Face, Arcteryx). These brands were created from the belief of their founders that they had a real experiential knowledge of what worked in certain scenarios and what was appropriate to end user needs. They also have a culture of sponsoring active participants to provide first hand extreme user feedback to the NPD process and in these scenarios the products can be much more closely aligned to the users requirements. Although other factors, including marketing needs and sustainability issues can further influence the process.

Unlike the apparel industry, in a cross disciplinary software and technical engineering environment issues appear where the design and development process often run hand in hand, with little reference to the real user needs. This can be accentuated by the project management methodology employed and the commercially driven desire to get products to market in as short a time as possible, often driven by a rapid prototyping concept model. While discussing project management in software design processes, Noakes et all (2003) suggest that ‘the design phase is where we create the solution that we hope will match the user requirements which were created during project definition’ and that ‘the design and build phase are synonymous’. Observations that seem to be at odds with the need for a clearer methodology in complex project environments such as Smart Clothing and Wearable Technology for the Active Ageing.

If we look at other industries, Buxton (2007) proposes that the bulk of current product development process is hampered by an organisational reliance on what he calls ‘two all too-common myths’: 1) that we know what we want at the start of a project, and, 2) that we know enough to start building it. This can even be seen at play in some of the biggest global corporations - in mid 2010 Google pulled a flagship project, Google Wave, which had been created and sponsored internally by Lars Rasmussen, one of the key architects of the Google Maps app (which is now used by millions of people around the world). Comments from industry observers at the time included “Wave has not seen the user adoption we would have liked” and “I predicted the death of Wave the day it was announced. It's a service made by engineers that nobody needed and didn't solve any specific problems”, CNET (2010). This was a perfect example of a seemingly good idea that fits Buxton’s proposition and illustrates the challenges in a complex project development environment.

Taking another example, Dick Powell, the founder of ‘one of the worlds leading design and innovation companies’, (SeymourPowell, 2010) has some useful observations to add to the debate on a cross disciplinary product design based methodology which is applicable to this process. A creative act (in whatever design and development
discipline) is followed by a belief in the idea then followed in turn by the embodiment of the idea, but he argues that the idea should be preceded by knowledge gleaned from an immersion in anthropological and ethnographic research methods, and that the designer should move back and forth between the logic of engineering/industry and the evolving societal needs of the user experience in order to be ‘dipped’ in the whole scope of a project (Powell, 2010). We could call this experience ‘developing knowledge bandwidth’, where the constant movement back and forth creates the bandwidth (Figure 2).

Working within the construct of the knowledge bandwidth and beginning to apply the theories underpinning the model of co-design that we are no longer simply designing products for users, we are designing for the future experiences of people, communities and cultures (Sanders and Stappers, 2008), we can see how the different methodologies from different disciplines can come together to become stronger than the sum of the individual components.

Sanders and Stappers propose that the ‘traditional’ design disciplines that focus on the designing of products are sublimating into the emerging design disciplines, which focus on designing for a purpose (Figure 3).

![Figure 2: Designers developing knowledge bandwidth](image)

![Figure 3: The transformation to the emerging design disciplines (adapted from Sanders and Stappers)](image)
It can be seen in Design for Ageing Well that all of the manifestations of the ‘emerging’ disciplines are active, where it is critical to the participants to experience the product, to be fully aware of the function and benefits, but that the emotional pull of the product is sensed – will the user feel a subliminal attraction to the product, like it and want it to become a friend for life. Smart clothes with wearable technology must be designed for interaction directly with the wearer and indirectly with the surrounding environment otherwise the products will not function, and of course given the pressing ecologic (and economic) pressures design and production of the products must pay attention to the issues of sustainability.

It is expected that products would be designed to serve a purpose (or multiple purposes) and ultimately they need to aim to be catalysts in transformation, reflecting recent experimental on-line research suggesting close links between feeling able and empowered to undertake some (walking) exercise, and the levels of self efficacy and self esteem in the third agers as a result of exercising, which in turn has a positive direct impact on individuals feelings of life satisfaction (Gallacher, 2010).

**Having an impact**

**User involvement in the design process**

During a research trip to the International Sports Business Network winter outdoor trade show 2010 (ISPO 2010), held in Munich the project team undertook some observational ethnography work on the trade stand of a major UK outdoor apparel brand. The team spent around one hour inspecting and trying a range of garments accompanied by a senior apparel designer from the brand.

The research team subsequently held a workshop in Newport (User Show and Tell, 2010), designed to give active ageing participants the opportunity to show and describe some of their own outdoor garments and to discuss some design prototypes for new garments presented by the senior apparel designer from the clothing brand.

Much of the discussion revolved around a prototype for a new garment to be released for the summer season which displayed some of the same design features seen on the garments at ISPO; poppers on outer storm flap, storm flaps over outer pockets and double ended zips.

What became apparent during the workshop was that none of the garments had been designed with any real thought for how an older user may want or need to interact with them.

Examples included:

- Small and difficult to grasp Velcro closures on cuffs.
- Small and difficult to use ‘popppers’ on outer zip storm flaps – the participant was unable to successfully fasten the poppers.
• Double-ended zippers (allowing the bottom of the zip to be opened upwards), which were difficult to actually fasten – the participants had difficulty locating the leading edge of the zipper through both pullers and were often unable to fasten the zips.
• Storm flaps over pockets which were very challenging to push hands through - the participants, having donned the garment had real problems locating the pocket, reaching under the storm flap and then locating the zip pull tag to open the pocket
• No garments in the female range, which were cut for a fuller figure.

The issue with storm flaps on pockets is interesting to examine, as there is a driver behind the design of this particular feature.

The garment in question was made from a specific brand of ‘breathable, waterproof fabric’, which has a high brand recognition rate in the end user market and has been consistently marketed for several years under the strap line ‘guaranteed to keep you dry’ (Brook, 2001). This particular fabric is constructed from a 2 or 3 layer model, with a micro porous membrane sandwiched between an outer and inner protective layer, the functional rationale being that water vapour molecules can migrate out through the micro porous membrane, driven by a humidity difference between the inner microclimate and the air outside the garment, whilst water droplets can’t get in. It has been proven by lab tests that this works in certain circumstances, but not necessarily in other real world circumstances (Stevens, 2008).

The longevity of the brand, having been introduced to the public in the late 1970s’ and the combination of the clear consistent marketing message, and subsequent brand recognition encourages potential customers to make a default assumption that they want that product. This allows outdoor apparel brands to feel comfortable including garments in their range using this specific fabric brand alongside other options.

To help maintain some of the rationale behind the marketing, the fabric brand provides the garment manufacturers with specifications to manage the use of the fabric and maintain some of the structural and design elements within each garment in order that the garment can pass the fabric brands lab tests to then qualify the strap line ‘guaranteed to keep you dry’. By following the specification the garment can be brought to market co branded by the manufacturer and the fabric brand, re-enforcing the psychological comfort factor felt by the purchaser. One of these specifications is to do with the construction of the storm flaps covering external pockets and this was one of the major problems of user friendliness consideration uncovered by the active ageing participant. The design detail made it very awkward to actually get a hand into the pockets.
User input to influence design

The research team next met the senior apparel designer from the brand at ‘Outdoor 2010’; the European summer outdoors industry trade show held in Friedrichshafen in July 2010. At the meeting, the team were presented with production samples of the same garment that had been discussed at the user show and tell workshop in Newport (User Show and Tell, 2010).

The garment design had been modified as a direct result of the observational ethnography work at ISPO and the active ageing participant workshop held in Newport in May 2010, with the following key modifications to the design:

• Removal of outer front zip storm flap, replaced by an inner flap with a drain channel and replacement of zip with a water resistant version. Removing the need for any fiddly small poppers to close the storm flap.
• Removal of two-way zipper function to facilitate easier fastening.
• Removal of outer storm flaps from outer pockets, and replacement of standard zip closures with a water resistant version (Figure 4).

The making of these changes was directly influenced by the experiences of the garment designer in working with the individual active ageing participant, the participant ‘show and tell’ workshop, and facilitated by the designer changing the fabric specification to a different brand, with similar properties, but with the flexibility to work to user needs rather than marketing and brand specifications needs. The process demonstrated a step towards a co design methodology for the designer and allowed the opening of a path to addressing the needs of a new market segment.
Further research

Further research is underway by this author in the form of a PhD study examining the cross disciplinary methodologies relating to the development of a shared language for the design of smart clothing, with a focus on the Active Ageing.

The study aims to reconcile the theoretical perspectives of cross-disciplinary design ideation with the practical needs of end users resulting in a communication methodology applicable to the active aging sector and beyond.

This author is planning a series of semi structured interviews with identified participants, and a series of more structured on line surveys to generate more detailed data directly from end users to triangulate with the theoretical models of cross disciplinary design.

The study is running in parallel with the Design for Ageing Well project, which has planned a series of additional workshops to take place in Newport during the autumn of 2010, working with a group of active ageing participants. The workshops will look in more detail at garment and fabric technologies, wearable electronics technologies with a view to more fully uncovering the participants understanding of the technology and potential functional needs. This information elicitation will then help to inform the design of prototype garments to be wear tested by participants and contribute to the final project conclusions.
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Design Education for Social Innovation: Preliminary Explorations

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Abstract
Studio-based design education in the United States has often been constructed to reflect the demands of design practice. Traditionally, this has been consumer-driven and responsive to local market trends and the private sector. Due to this, pedagogical strategies for social innovation are not often primary considerations for studio coursework within design curricula. While participatory design methods are increasingly being recognized as valuable sources for innovative solutions that facilitate the process of engaging and empowering people, these new opportunities for design have not yet been formally embedded in many curricular structures.

Two university courses serve as case studies to illustrate the significance of participatory design methods in social innovation. This paper examines the potential of alternative design pedagogy, one that is set within an ethical discourse based on social innovation and one that is grounded on an ethical construction of practice, which more accurately responds to the pressing needs of society and social change. It discusses the challenges to be faced, new tools and methods for research and design, and the change in mindset needed to address social transformation.

Keywords
Design pedagogy, social innovation, co-creation, social inclusion, participatory design methods, professional design ethics

Introduction
Studio-based design education has often been constructed to reflect the demands of design practice. In the United States, this has been traditionally consumer-driven and responsive to national market trends and the private sector. To this end, studio-based coursework has typically been developed to provide students with highly specialized skills and the knowledge necessary to enter a narrowly defined professional design environment. Social innovation, collaboration and interdisciplinary design practices within the studio are challenges for design professors who recognize the potential of social change through design action. Also, "young designers are coming of age in a world where increased consumption is no longer seen as the ultimate marker of growth. They have grown up during a period where the pace and demands of modern life are increasingly being seen as unsustainable, in both social and environmental terms. In this
context, they are beginning, in ever-greater numbers, to question the idea that design is primarily about material culture, or the business of making things” [1].

‘Design’ here and for the purpose of this discussion refers to the disciplines of architecture, landscape, interior, industrial and visual communication design. Each of these fields directly impacts the fabric of our physical world and indirectly affects our social and psychological sense of wellbeing. As creators of these environments and with so much at stake, design students - upon graduation- are expected to respond intelligently to societal and environmental challenges, practice a rigor of ethics, value social contracts and work effectively in multidisciplinary teams. Yet, design curricula, particularly the design studio, have been slow to combine this criterion and thus reflect the emerging landscapes of design practice.

New territories of design practice are emerging within and outside the traditionally defined disciplines of design. These practices are generating new environments of social interaction and professional engagement between designers and non-designers. Metaphorically, we could say that social innovation is on the horizon. Additionally, the realm of professional ethics has re-emerged as a substantive issue for environmental design [2], yet studio-based design education has been challenged to develop socially innovative experiences that fulfill these criteria and apply practices of design ethics directly. “Businesses innovate mainly for return on investment, society must innovate for social return” [3]. Due to its societal relevancy, design pedagogy must innovate for social return as well. The studio-based design curriculum can be socially innovative; it can be structured to have immediate and positive impact on communities through direct engagement with its citizens as co-creators. “Incremental change and business innovation alone are not enough. It requires experimentation, engaging citizens as co-creators, and the ability to turn promising ideas and new service models to the level of cities, regions…. and global markets” [4]. In this regard, pedagogy offers tremendous opportunities to train the next generation to this type of thinking, making and doing.

Social innovation inside/outside the design studio

The ideas expressed in this paper evolved from the desire to embed social innovation strategies into design curricula. The desire came from the motivation to help design students see that they could move beyond the role of the design expert to become social facilitators in collective creativity. The paper examines the potential of alternative design pedagogy that more accurately responds to the pressing needs of society and social transformation.

In this context it is critical to remember that Modernism -though also driven by the politics and the economic landscape of the time- had a strong social agenda. Undoubtedly many designers of that period were driven by societal needs and social innovation. Examples include the efforts of Le Corbusier and the design of the Domino House to solve housing problems for urban dwellers to Buckminster Fuller with the Dymaxion car to improve conditions of transportation. In fact, Fuller stated, cooperation had become the optimum survival strategy. Selfishness, he declared, ”is unnecessary and hence-forth unrationalizable.” He criticized utopian schemes as socially exclusive
and claimed that as the reason for failure. Implicit in this argument is the idea that any utopia must include everyone.

Though social innovation in design grew during the Modern Period, most of this development came from expert knowledge addressing specific social needs. The work of Charles and Ray Eames demonstrates this well. Familiar with the material potential and manufacturing process of steam-bent plywood, they designed a lightweight splint for war victims suffering broken limbs. Indeed, there were many significant influences that contributed to the growth of the economy and drove politics in America following the war, the content of which is too great for this paper. Yet, it is critical to remember that mass production, advances in manufacturing, and the dream of home ownership all influenced the landscape and the American mindset. Designers from architecture to industrial design were busy responding to ‘apparent’ societal needs and desires; they designed for others. “In the traditional model … a user’s only role is to have needs, which [designers and] manufacturers then identify and fill by designing and producing…” [5].

What we see today is a shift in design practice; collaborative design practices and the mindset of designing with people is becoming more prevalent. One of these methods is through participation. Though participatory design has been a steady force in design practices in northern European countries, these methods and practices have been more slowly accepted in the United States.

Currently, design firms and organizations are finding that the marketplace is no longer marketing-driven. We are witnessing now a major shift in focus and mindset from designing for people to designing with people. This is taking place in the design and development of products and services in the commercial sectors. More and more companies have developed on-line “customization” to reach a broader consumer audience who desire personalized products. Some of the reasons for this are: the on-line world’s ability to deliver to people what they want, when they want it and where they want it, the need people have to balance their consumptive and their creative needs [6], and the impact of the recession on businesses.

This type of design practice approaches the concept of designing with people, and is often referred to as “co-creation”. Yet, much of co-creation that is being offered in the marketplace today is based on choices that are quite limited and highly controlled. The participation of the non-designer is not typically found in the early front end of the design and development process and as such does not usually lend itself to capacity building and social innovation. Yet, an advantage of the move toward co-creation is that as consumers become more sophisticated in their consumption -demanding more sophisticated end products and experiences- they become more educated consumers. This in turn, may lead to an awareness of consumptive behavior and understanding one’s role in society as a consumer.

The Venn diagram below illustrates the relationships between social innovation and market-driven innovation. It provides examples of products designed for the consumer (on the left) versus products designed with the user as seen on the right. The size of the bubbles indicates the emphasis placed in the design studio and the quantity of coursework developed to design for as opposed to designing with users. Buckminster Fuller’s Dymaxion car is an example of a socially inspired design for people, whereas the design of the muscle car represents a market driven commercial product. The bike at the bottom right corner developed by Urban Outfitters is example of customization and
the Bamboo Bike on the top right exemplifies designing with the user for social cause. The Bamboo Bike Project provides a mode for transportation suitable for road conditions in sub-Saharan Africa. The project created a system by which these bikes can be produced in Africa with local materials and labour.

![Figure 1: Relationship between social-driven and market-driven innovation in the context of designing with and designing for Co-creation with the goal of social innovation is now appearing on the horizon. To date, it is more characteristic of not-for-profit organizations than it is for for-profit organizations since it takes a very long-term outlook for return on investment [7]. Co-creation for the purpose of social innovation requires an in-depth and hands-on approach to problem solving and opportunity identification. Lasting social innovation invariably involves people enacting change themselves in their lives, rather than having an external service solution delivered to them [8]. That entails a deep understanding of and empathy with the people who will be served through the design process.

Weaving social innovation into the design studio

The two university courses presented here serve as pilot projects to illustrate the significance of participatory design methods in social innovation. Though neither course is necessarily new in terms of research and design processes, they do represent “socially innovative” approaches for design instruction at the Department of Design at The Ohio State University. The insights from these studio-based courses serve as starting points for a curricular strategy in social responsibility within a professionally accredited design curriculum at a major university in the U.S.

The first case study developed inclusive design strategies and participatory design methods for an interdisciplinary service-learning course. This course provided for students to design in collaboration with inner-city teens supported by a non-profit community centre. The second case study examined socially excluded groups within
their own communities and proposed future scenarios as alternative outcomes to the traditional refined product or service ideas.

Figure 2. Studios in the context of designing for and with people including end purpose

The diagram above illustrates the approximate position of the two design studios in the context of designing for and with people, and for what end purpose. The value of participatory research and design methods along with the insights generated by those interactions is demonstrated through the forms of engagement and the social interactions that took place during both courses. Both are grounded in a discourse of ethics and both advocate socially responsible design and adapt methods of social inclusion. The role of visualization was critical in both studios, as well. One of the studios required visualization methods for collective creativity and the other required new visualization methods for communicating future scenarios that conveyed product and service “actions” rather than physical product details.

**Studio-based Design Curricula**

Throughout the design curriculum, students are expected to increasingly understand the social, environmental and economic impact of their design decisions; this is often learned through professor instruction, criticism and peer evaluation. Rarely do the results of the coursework, particularly in architecture design studios, have direct impact on the social contexts in which the project was based (if it was not wholly fictitious). In conjunction to this, socially responsible design and theories of social innovation through design practice and design ethics are often relegated to seminars in professional practice, wherein course content on ethical design practice that is disseminated through readings and class discussions remains abstract.

Education within the Industrial Design studio has, traditionally been focused on skill building and project-based topics. Curricular topics typically range from simple to complex problems; as students progress through the design program expectations in mastering skills increases. Hands-on experience for the beginning student is significant in order to introduce ergonomics, while the next part engages materials, processes,
manufacturing. These all lead to a better understanding of the consumer (end-user) and constraints of mass production, but none of these necessarily indicate the long term affect on society, the environment, or the health or wellbeing of individuals.

Interestingly enough, assessment of student work is based on outcomes of product success, which tend to showcase the preeminence in form making. Professional accreditation bodies evaluate a program’s success based on skills demonstrated, not necessarily curricula strategies in social innovation.

An Interdisciplinary Service-Learning Design Studio to Build Community Capacity

“Thoughtful, inclusive design creates lasting change in communities...Design is important to every aspect of our lives. It informs the places in which we live, work, learn, heal and gather” [9].

Design/build studios are not new to community-university partnerships; they are structured to ‘serve’ the community, leaving behind a useful artifact, building or shelter for the community. The pedagogical models of Rural Studio, Over the Rhine and Community Designs at UW have popularized this type of experiential learning for design students. Yet seldom are the studio courses of visual communications, industrial and interior design part of this pedagogical model. While design/build studios offer design services to communities, the question remains: What participation in the design process did the community members have? During the design/build activities, was capacity building part of the activities with the community? If so, how was this achieved?

In terms of social innovation, these were the critical questions that drove the service-learning course offered at The Ohio State University. Structured as an interdisciplinary design course, the studio was premised on a “testament of the ability of people to come together to envision a better future” for the neighbourhood [10]. Including all the stakeholders within the design process was a primary objective.

The service-learning course involved university students and members of a local non-profit community center, which provides social services to the disenfranchised urban neighbourhood. Together, the students and urban teens from the center collaboratively designed and produced new furniture, wall graphics and outdoor benches for the community center. This type of learning provided students with opportunities to co-design with non-designers in a participatory design environment. According to Tom Dutton, this “expands inter-cultural experiences [that] foster an ethic of civic stewardship and the practical knowledge to engage with issues of social justice through design practice” [11]. All of which move us closer to socially innovative design pedagogy.

To foster the collective creativity and facilitate dialog in the co-design process, participatory design methods were employed. These methods of design were intended to cultivate social innovation through interaction and knowledge transfer. Each week, university students prepared tool kits and went on-site to design with the urban teens. Each tool kit was specifically prepared for a particular phase of the design process. The items in the tool kits ranged from 2-dimesional images representative of interior environments to 3-dimensional space-defining cardboard boxes. The first interaction was
based on creating a collective vision for the future of the community center and the role that the teens could play in altering the negative perception many have of their neighborhood. Following full-scale furniture mock-ups made of scrap cardboard, designs were finalized and construction began. Several inner city teens made their first trip to the university campus and worked in the wood shop with the university students building pieces for the community centre. In the end, the furniture, interior graphics and landscape elements were reflective of the local culture and the innovation that took place between these two diverse groups of people (Figure 3).

Figure 3. Participants in a group session working with generative techniques to identify project opportunities

The service-learning course went beyond providing a design service; it built capacity in the community. Because the course was structured to design with the users, the interactions were beneficial to both the university students and the urban youth. The university students claimed to shed preconceived ideas about disadvantaged neighborhoods and the teens gleaned from the experience of working with university students. They claimed that the dream to attend college “didn’t seem that far away anymore”. The premise to “build the local creative capacity, promote local innovation, foster participatory development and co-creation…” [12] was achieved.

An Industrial Design Studio for Social Inclusion

“Social exclusion is about the inability of our society to keep all groups and individuals within reach of what we expect as a society…[or] to realize their full potential” [13].

The topic for a third year industrial design studio was inspired by one of the RSA 2009-2010 Design Directions briefs. The brief challenged students to “look beyond the mass market to develop an understanding of the needs of those who are excluded, often inadvertently, and to develop a response that meets their needs and increases their quality of life” [14]. Additionally, the learning goals for the course included: to develop the student’s ability to become more comfortable handling open briefs, to gain experience with participatory design research methods, analysis and communication of research findings, to develop an ability to translate findings into actionable concepts, and to explore alternative methods of communicating findings and proposed solutions.
The first challenge for the students was to identify the focus and the scope of their projects. A clear constraint to the success of the project was access to a specific user group. Given the limitations of the Institutional Review Board IRB research guidelines, the students needed to know people willing to volunteer their time during the research and design activities. Once the teams were able to identify family members and friends that experience some type of social exclusion, they were able to frame, schedule and conduct the primary and secondary research activities. The areas of study that the students chose included people with dietary restrictions, the elderly, student athletes, people with vision loss and people who are overweight.

The first activity each of the team members conducted was a “preconception dump”. During this exercise the students were able to acknowledge their own pre-conceived notions of experiences, dreams and aspirations of people in the chosen area of study. After this exercise, the students developed surveys, interview guides, observations and participatory design activities such as maketool collages and Velcro models (Figure 4) in order to elicit past and present experiences as well as to enable the participants to describe desired future scenarios. Additionally, the students were asked to consider whether to design “for” or to design “with” their participants early on during the research process. The answer to this question assisted them in determining the focus and the scope of their project.

The project yielded excellent results in terms of the course learning goals. The students were able to recognize how design research can provide relevant inspiration in order to address social needs and desires. They were able to understand the importance of including people in the design process as active participants in the innovation process and that the in-depth knowledge of the experience goes beyond providing a set of “needs”. Two students working together stated the following: “Ultimately, we learned that designing with our users instead of for them was extremely valuable to our process. Their involvement was key to reaching effective solutions. Our initial preconceptions included some ideas regarding design opportunities, but did not come close to describing all the features and systems that our respondents could dream up.”
While the project results were rewarding for the students and faculty, this experience also revealed several voids in the current curricular structure. One of the most visible was the fact that the skill sets necessary to visualize and develop individual 3D concepts are very different from the skills needed to visualize and communicate research results, desired outcomes, current and future scenarios (Figure 5). Although the students were able to experiment with different media, there was no previous exposure to advanced computer graphics and animation software. The University has a specialized centre in computer graphics and technology innovation and access to this centre’s experts during the course of the project would have been ideal. As a result, the faculty in Industrial Design are currently developing coursework in collaboration with the Advanced Computing Center for the Arts and Design to better prepare the next group of students. And while this effort doesn’t address the larger curricular challenges, it is the first step towards expanding the understanding of visualization in the context of service design.

Conclusion

Design education in the United States -particularly studio-based design curriculum- is limited. Pedagogical strategies for social innovation and inclusion throughout the design process have not been driving initiatives for studio-based coursework within design curricula. Yet, to prepare students for real life situations and the complexities that exist, opportunities must be made in the studio to get them prepared for life outside the studio. Engaging communities of designers and non-designers on local and cross-cultural levels provides students with opportunities to understand their role in society as facilitators of and designers for social change.

From the pedagogical experiences of these preliminary explorations in design studio, the authors offer the following as criteria to better prepare design students:

• Interdisciplinary team-based collaborative work
• Pedagogy grounded in ethical discourse
• Diversity – a practice centered on the voices of many (designers & non-designers)
• Faculty who possess the mindset and drive to explore relatively uncharted domains of the emerging design spaces

Finally, there is a need to redefine interdisciplinary and collaborative learning. The focus on environmental and social responsibility, diversity and inclusion needs to be addressed from the beginning of the educational experience and supported at different
levels, from course content topics to overall program goals. Design departments as well as professional accreditation bodies will need to develop a unified, coherent assessment program to evaluate educational activities that go beyond traditional models of pedagogy.

References


[4] ibid


Inclusive Designing with Gender Fluidity

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Abstract
Building upon the author’s previous works, on the dimensional modelling of gender identity, role-play, and personas, this discursive paper goes on to consider the concept of Inclusive Designing with Gender Fluidity. Gender Fluidity refers to ongoing perceptual and behavioural changes in individuals, where their performativity of gender may relate to changes in social context. It is proposed that developing recognition of directions and degrees of gender fluidity, aided by visualisation tools like the gender fluidity cube, enable opportunities to be identified, explored, and possibly then to empower more inclusive responses to the needs and interactions of individuals. Through the vehicle of clothing design this conceptual project investigated how we might more inclusively approach the broader experiences of gender, and more specifically gender fluidity, through the development of a series of prompts and choices, for more effective investigation and consideration of gendered needs and designs, to support social innovation.

Keywords
Gender, Fluidity, Performativity, Identity, Clothing, Design.

Introduction
In the spirit of open-mindedness and inclusiveness, towards improving quality of life, designers will increasingly find themselves needed to engage in more ethically considered dialogue and development around the cultural taboos of: death; diseases; mental and physical impairments; environmental destruction; homelessness; bodily excretions; anti-social behaviours; human exploitation; sex; religion; and fear. To improve quality of life, designers must not shy away from these ‘socially inappropriate’ topics, but contribute their support to the development of new ways of seeing, thinking, and doing, to engage with these human challenges more effectively. Design research communities and practitioners have already made inroads into a few of these areas.

If we are to develop more inclusive perceptions and behaviours we need to be willing and able to question, and change, unhelpful personal and social constructs, such as: sport is masculine; housework is feminine; and gender is binary. Nevertheless, we may decide there are some broader and therefore more workable constructs like: power and aggression are masculine; care and socialising are feminine; and that each individual will have a mix of masculine and feminine traits and experiences. Developing new perspectives on life requires more appropriate ways of modelling the world and its complexities. Gribbin [1] described how scientists dealing with complex systems have been successful in developing our understanding of those systems though simple
models. These models allow basic theories to be tested, where the results then contribute to those models being deepened into more robust models. Though these models will not suit everyone’s world-view, designers and researchers do work in this way, developing concepts to test out, applying feedback to create more workable design solutions and eventually new knowledge, products, processes or services. Simple models are often applied, in preference to complex models, in order to reduce cognitive effort in informing us about our day-to-day social and environmental contexts. However, it is argued that while our literacy of the world has increased over time through the creation, sharing, and revision of these constructs, certain overly simple models have remained unchanged and underdeveloped for centuries, becoming deeply embedded in our cultures and languages. It would seem that some elements of world-view and self-perception may actually be ingrained in the individual during initial personality development, (Dittmar [2]), and while these individuals may be able to ‘intellectualise about what could be’, their language may constrain their ‘thinking about what is accepted’. Gender and identity are examples of complex systems, where individuals are influenced by cultural and contextual factors where some change is random noise while other change follows a complex order.

It was argued by Hilton [3] that it is apparent from gender and identity literature that the simplistic ‘binary’ model of male-female and masculine-feminine is constraining deeper thinking and engagement with the more complex nature of gender. Therefore, a dimensional model of gender identity was proposed with the axes of sex, sexuality and gender, in support of the three most commonly referenced elements of gender identity. Since publication of the earlier model it has continued to develop as the author sought to further rationalise and accommodate some deeper qualities of gender identity, identified through discussion around the initial model. The latest revision is illustrated in figure 1.

Figure 1: Gender Fluidity Cube

The ‘individual’ may now be described within the dimensional volume as a smaller volume, rather than the previously proposed positional point. Individuals are expected to experience a sense of range on the axes not a clearly defined point.
O’Keefe [4] previously proposed that sex, gender and sexuality are fluid concepts. This means that over time and across contexts the ranges on these axes, and therefore the identity volume, proportions, and position, may change. This model allows those changes to be recorded, registering individual’s gender fluidity experiences of products and services or changes in social context.

The author’s model also enables recognition that there may be personality determinants in the definition of an individual’s volume. Some may feel ‘philic’, attracted toward the extremes, while others might feel ‘phobic’, being repelled from the extremes. Some individuals may even be philic on one dimension while phobic on another. A further challenge on the sex dimension was the need to relate to body image issues, (Grogan [5]; Dittmar [2]), in addition to physical definition of the body form. It is suggested that some individuals, possibly those who are philic and empathic, will perform a level of mimicry, conscious or non-conscious, as they seek to engage with changes in social or environmental context. It is proposed that such individuals might be classed as more ‘fluid’ in nature, and typically their identity volume might be larger and more frequently change proportion and position, than more set and possibly phobic individuals.

Moving this developed concept into the present investigation, the purpose of the author’s work was to develop and share new ways of seeing, thinking, and doing, so that more considered and inclusive design may be possible. It is proposed that in a developing society, and as part of responsible design practices and social innovation, greater understanding of gender would need to be gained if we are to respond appropriately to the opportunities of understanding and change.

**Context**

Gender, as one of the three themes and axes of the Gender Fluidity Cube, is not a given in the way that genetic code is, but may be a learned or chosen social behaviour, an active performance or performativity (Butler [6]). This context dependent performativity could be said to be a political issue, in that it is a key component of how we live, but not necessarily how we would desire to live, for our Subjective Well-Being, (Dittmar [2]).

For a variety of reasons, many people may be happy with the status quo, experiencing no need for, or interest in, change because it is not perceived to involve them. Some individuals would actually seek to maintain the status quo, because of anxieties over the experience of ambiguity in the early stages of acknowledging difference and change. It is suggested that this would be an experience common to many other equality and inclusion concerns. Two key factors of influence are proposed to be: social constructs, the belief systems of a culture; and social innovation, the opportunity for change enabling individuals and social groups to explore new qualities of life and well-being through more accommodating products and services.

Consumerism has encouraged a desire for change and diversity, developing the belief that the new may lead to a better quality of life, (Dittmar [2]). In acquiring these products or engaging these services we may explore and develop our selves, and may seek to display our possessions or behaviours as messages of change of status or identity. The desirability of the new is suggested by the media, but for some this can lead to the experience of Self-Discrepancy (Higgins [7]), for not attaining their ‘Ideal’. It is proposed here, that products and services which touch on the dynamics of social constructs like gender will experience greater success through an incremental as opposed to a radical approach to social innovation. However, a significant number of individuals continue to carry a value perception that feminine attributes are in some way
second rate, and that this perception is so strong that attempts to change it seem doomed to only short-term success. (Suthrell [8]).

One reason for the greater success of the incremental approach might be our need for recognition as socially viable beings (Butler [6]), and the language by which we ‘recognize’. In order to communicate and engage with change, each culture is constrained by its language. A message perceived to be clear at one time, or in one culture, may hold little or no meaning in another, but without some foundation for communication we cannot move forward effectively.

To serve the possible needs of communicating gender fluidity, we may require products and services that reflect changes relatively quickly, ‘I care’ or ‘this situation is making me aggressive’, enabling recognition and reducing potential anxiety. The most important personal media for communicating change is our clothing, so this investigation considered how clothing might support the communication of gender fluidity, in terms of choice of garment, how we might choose to wear it, and how we might experience it. This included the concept of gender adjustable ensembles. See figure 2.

![Gender adjustable ensembles](image)

Men’s wear is a useful vehicle for discussing change, because it still has nowhere near the freedom of expression of women’s wear. This paper does not seek to evidence the existence of a market for the gender fluid, though it is believed that the Internet could prove to be the largest marketplace, (Slater [9]).

The conceptual role-play and persona process described in this paper is not proposed as something that must be engaged with physically as a design process to accomplish effective gendered design work, but that this approach did serve to develop some useful perceptual prompts. Designers may now choose only to use the perceptual prompts to move their thinking forwards. It should also be noted that the purpose of this investigation was not to propose example garments as marketable designs, but instead to use these concepts to aid engagement with the consideration of meaning and value within the process of designing with, as opposed to for, gender fluid experiences.

**Method**

It is generally acknowledged in the social sciences that in addition to the ethical considerations when investigating topics like sex, sexuality and gender, it is challenging to get reliable data from respondents because much of this subject area is considered taboo in many cultures. Even when participants appear to be cooperating they may be unable to fully disclose and discuss their personal context. It is acknowledged that the nature of this taboo can even deter self-exploration, which means that some individuals
will find they are unable to engage with a role-play approach to research and design, for example to experience garment fit and function.

The author decided that since this stage of the investigation would remain conceptual it would be more effective to explore the clothing aspects personally, to consider, develop and reflect upon their relevance and value through his own perspectives, to inform possible future developments with others.

Table 1: Concept clothing design considerations

| a. Opportunities for clothing to express gender fluidity in the present day: |
|-------------------------------|-----------------------------|
| 1. Capable of relatively rapid change, or short period use. |
| 2. Capable of moving between perceived masculine and feminine cues. |
| 3. Concepts which might work with accompanying garments. |
| 4. Concepts appropriate for business or casual wear. |
| b. Development, prototyping and testing of a number of garment concepts, to explore: |
|-------------------------------|-----------------------------|
| 1. Recognition |
| 2. Practicality |
| 3. Sensorial Aspects |
| 4. Expression Cues |
| c. Sample garments displayed to elicit questionnaire responses. |
| d. Opportunistic discussions with a number of openly gender fluid individuals. |

These considerations were to lead to a review and discussion of how the findings further informed understanding of support for expression of gender fluidity.

The Concepts

A general look at clothing suggested that there are a number of garment types worn by both men and women, but because of choice of fabric, structure, detailing, and how they are worn, they may be perceived masculine, feminine, or neutral. These are further categorised by language, e.g. shirt, blouse, T-shirt.

To make a shirt appear to be a blouse, it might simply need decorative caps fitting over the buttons, provided the material and colour supported such transformation. However, to make a blouse appear to be a shirt might prove more challenging because of the manufactured structure. Alternatively a row of buttons and holes on both sides of a shirt front would enable the ‘buttons left for girls’-‘buttons right for boys’ rule to be played with. Neckline would also seem to hold some cues for gender, which might suggest opportunity for replaceable necklines. There are already trousers which convert to shorts, and jackets with removable sleeves, so modifiable neckline might not be too radical a concept. We may take this zipper concept further, to convert trousers into skirtting or vice versa. However, there would be a need to resolve the question of comfort, accepting that it may be easier just to swap to a skirt, or put a skirt on over trousers. Alternatively, we might reconsider what a zip needs to be, as a flexible re-sealable interface between two surfaces.

Length of shirt might be used, in the way that shirt-tails may be worn in or out of the trousers, but for this to provide more feminine cues than normal shirt tails it was proposed that they would have to be notably longer to provide a skirtting cue such as a long T-shirt might. However, cut and length would have to be comfortable enough to tuck into the trousers when desired, so would be unlikely to extend much below the crotch, without the use of a split hem. Another opportunity is to use material that is a different colour on each side and deal with the seaming in such a way that it is a reversible
garment. Different colour or pattern might be used to display masculine or feminine qualities in keeping with the wearer’s experience of self in context. The final opportunity considered was of ‘occasional’ wear, involving clothes which would only be intended for short period use like party/evening garments. The key elements of expression might involve choice of fabric, colour, pattern, and cut. The concept of cut and detailing in, for example, dresses for men, acknowledging the lack of breasts and different physical body-image might be constructed to appear less feminine if required.

The more interesting concepts generated by the author were constructed and tested as prototypes to gain a deeper understanding of their merits and feasibility for creating changes in perceptions and expression of gender fluidity.

**Concept Testing**

A number of concept garments were prototyped, to enable the author to better understand the physical and emotional aspects these garments facilitated. Two pairs of garments were then selected for display in the School of Design to enable fashion staff and students, and the broader design community to offer feedback by way of a questionnaire. See figure 3.

Figure 3: Two casual wear concepts (left), and two occasional wear concepts (right)

The first pair of garment concepts represented casual wear, while the second pair represented occasional wear. In summary, it was noted that there were some opposing opinions from the sample group, regarding the values and messages held by these four garment concepts. Research involving range of emotional responses to materials, (Hilton [10]), found similar variation in responses. Regardless of the construction quality, the majority found the concepts acceptable, while a minority read and responded negatively to the intentionally transgressive ideas, possibly experiencing some phobic response to the ambiguity. Overall, the general response to the researcher’s somewhat more masculine selection and cut of materials, colours and textures, was still to read these garments as feminine. Few participants related the garments to male or indeed gender fluid use; such was their strength of categorisation.

The author describes in the following sections his experiences and reflections on using a role-play approach to testing these prototypes. First person is used so that the accounts are not misunderstood as objective generalisations but subjective user-experiences.
Recognition

An immediate reaction I have to any garment detailing which is unfamiliar, is to categorise it as feminine, even though I know it is unhelpful to prejudge. It is as if I identified that I possess a perceptual algorithm that states ‘If I have not seen a garment or detail worn by a masculine individual, then it is a feminine garment’. This lacks logic, but I believe this prejudging error to be shared by others and propose that it is part of the recognition process. Butler [6] uses the term recognition in the context of social alienation, which can lead to dehumanisation and possible acts of violence against non-conformers if opportunities to understand are not taken. However, my use of the term has been to build upon this, broadening it to adopt an internalising perspective, to include the context of self and the perceptions of ‘Me-ness’ (Schultz-Kleine et al [11]), or ‘This is me - This is not me’, when considering new clothes, or when dressing, regardless of gender. For example, I have come to recognise that for whatever reason, most pattern print, for example on shirts, is just not me.

On further reflection, it is proposed that the sense of recognition might also relate to ‘this is what my partner might wear’, or ‘this is what some of my social group would wear.’ So the meaning of the clothing could be argued to go beyond ‘this clothing belongs to me’ to ‘I belong with this person/these people’.

I created a number of prototype garments out of different materials, to try on at home, and experienced self-discrepancy. However, spending evenings wearing these prototypes I found I did come to recognise myself in some of them, but most definitely not all. It is proposed that part of the perception problem in designing for gender fluidity is that the process is not about designing women’s or men’s wear, but designing to express identity, and state of mind, inclusively enabling individuality to be expressed and recognised. On reflection, this might suggest the need for extended self-education for individuals to become more familiar with congruent modes of expression.

Following some informal interviews of gender fluid individuals, it was clear that there is a diversity of needs and desires. Some may be appalled if they are mistakenly categorised as the opposite sex because of the way they choose to dress, because fluidity is not exclusively a conscious behaviour, while others do consciously decide whether they want to perform as a man or a woman when they start their day.

Designers should also acknowledge that in some cases, if the ‘persona’ created by a product or service is strong enough, some individuals may experience a sense of change of identity to fit, (Dittmar [2]). So, garments might be argued to function as more than a media of identity communication, as their influence could be considered as also facilitating disguise or acting as agents of change. During this investigation while I did not feel any increase in femininity at first, perceiving myself to be in experimenter mode, I did begin to feel more feminine over time as I settled with those garments that I came to recognise a degree of me-ness with, as a Heterosexual-Feminine-Male. However, the expression of femininity as a male does not have to mean cross-dressing behaviours, it may simply be the holding of feminist attitudes of caring and inclusion.

Practicality

The experience of this broadly experimental approach to prototype testing enabled some simple, and to everyday users obvious no doubt, observation to be documented:

- Tight skirting might feel ‘protective’, but constrains the gait.
- Long skirting gets under the feet when sitting, and when ascending stairs.
• Depending on fabric, garments that are tucked into trousers may become creased, possibly influencing the desire to just leave them in their outer mode, or make a detail of the creasing.

• A garment may cause what are seen as gendered behaviours. On review of a lot of these experiences, it became apparent that a lot of what I had taken to be natural feminine body language was in fact a result of constraints and influences of the garments. I concluded that some garments are being worn more for how they look, than how they feel or perform, because practicality cannot be a priority. It would seem to me that there are no obvious practical advantages to wearing a skirt or dress, which is possibly why many women, these days, choose to wear trousers. The purposes of wearing a dress could be: to signal or celebrate confidence with femininity; because it is socially believed to be attractive; and because women are ‘allowed’, usually without negative consequence. There are some gendered differences in perception and experience in shopping for clothes. Dittmar [2] describes common perceptions of men shopping with practicality in mind, while for women it is about engaging with the search and purchase experience. A stereotypical masculine perception, ‘ownership’ and ‘dominance’, may support a belief that women are seen as dressing in order to attract male attention, or that they dress-down to deter their attraction. However, the majority of women describe dressing as being for themselves as individuals, wanting to express their femininity, as is the case with publicly cross-dressing males. (Garber [12]).

Sensorial Aspects

Appearance is important in terms of what message the garment is attempting to transmit, but its success depends on whether the audience receiving the message recognise it and take its intended meaning. Meaning has to relate to past experience, yet if there is insufficient or ill-informed experience, the message becomes ambiguous and possibly misinterpreted. Choice of fabric is clearly important, for example in how it reacts to light, reflective may suggest glamour, where as dull may suggest utility. Social perceptions are continuously changing, and in terms of colour messages, especially in relation to pastels, they are presently changing their previous feminine connotations, while dark colours are still giving the impression, in Western culture, of dominance.

The drape of the fabric may also be important, where rigidity can be read as masculine while fluidity and clinginess can be read a feminine. Feel is important, and how it changes in context with task and temperature. Again it is down to the individual. Hilton [10] described an experiment in emotional response reliability to a range of materials, where it was found that almost every material was someone’s most favoured whilst also someone else’s least favoured. I found the sensation of skirting significantly different to trousers in the way the material moved over the skin, and in fact noted that skirting is less likely to chafe than trousers when sitting or moving.

To a lesser degree, sound can be important to some people in positive and negative ways, relating to context. Similarly the qualities of smell may carry sensory meaning. An important aspect of the sensorial is how it makes the wearer feel physically and psychologically: comfortable, secure, powerful, etc, within context, so that their experience and behaviour is congruent with their gender identity.

Expression Cues

It is proposed that self-discrepancy may occur for a period with any change in clothing. If everything was acceptable to all, then the marketplace would appear to lack meaning or
any sense of trend direction. The way the individual wears the garment with the ensemble of accompanying clothes and accessories, adds further cues. For example, wearing a belt round the waist, resting on the hips but not holding anything up, acknowledges the individual has a waist, and is presently read as a feminine behaviour. Nevertheless, there are men who should be proud of their fitness, and if the individual is wearing a long garment a belt can help break up the extended form.

More blatant cues involve body language, such as posture and movement, beyond those encouraged by the garments, and in some cases pleasure may be experienced by some individuals in the exaggerated enactment of social stereotypes. However, cues transmitted are not the same as messages received. Some people would still be anticipated to read the image of a man in a dress as homosexual looking to attract other men, even though the majority of homosexual men might have their interest stirred more by men in suits. Most homosexual men seek masculine attention and share a rather masculine trait of promiscuity. According to Garber [12], it is only ‘drag queen’ gays, who more confidently enact ‘fantasy’ female roles, to lure males. This general misunderstanding of intended message could relate to the impulse of some to categorise the unfamiliar as ‘other’ in order to decide how best to proceed with a ‘situation’. Sadly, these categorisations of ‘other’ can result in avoidance of engagement in conversation and a loss of what might have been an enlightening discussion. A number of investigations (Garber [12]) have indicated that men who wear women’s clothing are mostly heterosexual. The author suggests that because these individuals make an effort to keep their activities quiet, to avoid potential for negative reception, the social perception is taking longer to adjust the way it reads the cues. Nevertheless, as a rule of thumb for more expressive individuals; where a greater number of feminine expression cues are transmitted via a garment, the more strongly feminine it will be received, and that if this makes the male individual’s appearance a radical one, the longer it may take to gain wider recognition and acceptance.

During this investigation I experienced no fluidity across my sexuality or sex dimensions, only in the performativity of my gender. However, it seems possible that bisexuals might feel or trigger change in the sexuality dimension of gender identity by the responses they get from others to their mode of communication of identity.

**Discussion**

It is argued here that intentions to discuss and promote gender inclusivity are challenged by the constraints of the language by which we refer to behaviours. Many so called ‘masculine’ or ‘feminine’ behaviours and abilities, with the exception of a number of biological functions, should not be labelled as such. Labelling simplifies our world-view understanding, enabling decisions to be made more quickly, but may constrain our perceptions and development of more effective understandings. However, it is recognised, (Suthrell [8]), that while many transsexuals would prefer their bodies to be ‘corrected’ to the opposite sex, many transvestites particularly like making the choice to be female or male at certain times.

The dilemma is in successfully enabling the perception of masculine and feminine gender qualities to be understood as separate to male and female sex. Connell [13] said masculinity is not a concept held by all cultures, nevertheless, presently there is a general desire to maintain a level of polarity, to avoid the perceived greyness of unisex propositions, (Suthrell [8]). In discussions about men expressing femininity, a key visual consideration in Western culture would seem to be the significance of body hair. Body hair is not seen to be attractive to the majority of people. It is often viewed as a bodily
attribute to be hidden or removed. A man with body hair in a dress is therefore not read as a woman, but as overtly ambiguous.

It was considered that designers might develop clothing that could be used to enable change of expression and behaviour to varying degrees, figure.2, bearing in mind that gradual familiarity and acceptance of dress for expressions of gender fluidity may also affect the meaning of such clothing. In taking a role-play approach to gender fluidity design, it is not suggested that the designer will come to fully appreciate and understand the diversity of another individual’s experiences, but that this process could enable new ways of questioning and thinking about individual’s needs and the market opportunities.

In conclusion of this conceptual investigation, the recommendations were that the design process should include: ‘recognition’, ‘practicality’, ‘sensorial’ and ‘expression’ considerations, possibly enhancing engagement and understanding through role-play.

It is proposed that the individual’s desire to change appearance, in keeping with their experiences, would initially be for personal emotional recognition of change of context or mood, before any practical social benefit. Further research needs to be carried out to investigate reception, interpretation, and benefits.

Presently, there is no evidence to contest the findings of Suthrell [8], that clothing practicality and the social ‘need’ to read masculine attributes as a higher status than feminine attributes, negatively influences the social acceptability of a feminised male appearance in the West. Nevertheless, it is hoped that the process of considering a dimensional model of gender, in addition to designs’ role in supporting gendered needs in products and services, will begin to inform a more responsible design practice; and in conjunction with a more responsible media, to facilitate greater inclusion of gender diversity and fluidity through social innovation.

References
Session 3D
Cultural Contexts
The importance of researching requirement of older users for clothing design education in China

Wang Lu

Abstract

China now faces the same ageing population problem as in Japan and Western countries. This phenomenon is being researched in China, in terms of medical and social implications, but not in Clothing design, especially in the area of smart textile applications for functional clothing. The challenge from the clothing industry is the lack of qualified designers with the appropriate knowledge and skills for ageing design. The design educators must rethink education strategies and make necessary adjustments to the current system.

The purpose of clothing Design education and practices should meet the requirement of the older user in China, and improve new designers’ skills in product development. This paper is a report of my personal journey of identifying insights to develop new course of clothing design in Chinese design education system. Three areas were identified: addressing ageing population, co-design methodology and interdisciplinary collaboration.

I will present my research insights in Inclusive Design for ageing, including comparative research on ageing problems between the UK and China and consideration of the impact of this new market on Chinese design education.

Introduction: The challenge of the demographic change

China is currently in a period of demographic change, moving from a relatively young age population structure to an aging structure. The year 2030 will be a turning point in this transformation. In the first phase, from 2001 to 2020, the ageing population will rise rapidly, reaching 248 million, representing 17.17% of the whole population structure. (Commission on Ageing in China) Population ageing will have a significant impact on China in economic, social, cultural and other fields in the near future. Faced with a huge ageing population, how design may affect all aspects of life for old people becomes an important issue. Designers and manufacturers who meet the challenge of ageing will find a receptive and growing mature market. (Huppert 2003) In some countries, designers have begun to realize the impact of the ageing population on society as a whole. The theory of Inclusive design, promoted by the Helen Hamlyn Centre, Royal College of Art, is driven by two major trends - population ageing and the growing movement to integrate disabled people into mainstream society. (Inclusive design toolkit) Inclusive design has a crucial role to play in maintaining people’s health, capability and independence. How
could embedding inclusive design thinking into clothing design course in China make better clothing for all in the society?

Facing the huge market demand from older people, China must now attach importance to aging design research and design practice. On September 12 to 19, 2010, in Beijing, the School of Art and Design at Tsinghua University and The Royal College of Art, UK, co-hosted a Summer School with a series of presentations and workshops on ageing design. The Professors and design educators from both China and the UK had a broad discussion and communication on many design topics related to older peoples’ real needs, especially related to their living circumstances and daily activities. Inclusive design for ageing was one of the most discussed issues during the programme. In my current role as a Visiting Scholar in the UK, I attended the Summer School, due to my involvement in a UK research project concerned with design for the active ageing. Through my participation in this design research for ageing, I now wish to develop research theory and practice to guide design education in China to address the needs of the growing community of old people. In particular, in my design management position in a Chinese design school, I wish to prepare new designers for the challenge of design for ageing, and in particular, in relation to the clothing industry.

1 Understanding the needs of old people

1.1 Cross-disciplinary Research to Understand End-user Needs

In clothing design, the aesthetics, fit, comfort, ease of wear, price and ease of personal care are common concerns for the end-user. Meeting the needs of users is the basic characteristic of Inclusive Design, and the starting point of design for ageing is researching and confirming the older users’ needs. Compared with the traditional trend-led fashion design approach, the purpose of design for ageing is to enhance well being of the older people. The design process will start from the combination of research and understanding the needs of elders. The designers and the end users work together when designing and developing functional clothes for older people.

The focus of the UK research project is on design to promote healthy exercise, and in particular, encouraging the ageing population to participate in walking. The subject includes three topics made up of work packages in ‘Behaviour’, ‘Clothing’, and ‘Technology’, combining sociology, physiology, psychology, clothing, and wearable technology, etc. These work packages explore functional clothing design for older people. The ‘clothing’ research team is experienced in areas such as the size and fit, for a range of figure types, the language and terminology of technical textiles, and the sophistication of outdoor clothing design. (‘Design for Ageing Well’ Newsletter, New Dynamics of Ageing project, 2010)

1.1.1 Research on size and shape of old age group

Aspects of the ageing body to do with size and shape include reduced height, changing waistlines, that thicken, and feet that become wider, as the ratio of body fat to muscle changes. An awareness of such changes is important for the designers and
manufacturers of footwear and clothing. (Huppert 2003) The Clothing work package, in the early stage of the project, has focused on collecting data from measuring and scanning older peoples’ bodies. It has also been important for designers to learn all that is involved in user engagement, especially in working with older research participants. Selected data from the body scans of typical men and woman will be made into basic blocks, tested, and then used to develop style patterns and to make toiles. The older participants will be invited to try these toiles and give their comment to the fit, length, and to contribute to on-going style development.

1.1.2 Environmental impacts

In different regions, people are wearing clothing in significantly different ways, which is also affected by the climate and the local environment, as well as the living environment and conditions. The environmental factor affects the needs of end users in different regions. For British people, climatic characteristics make people concerned about clothes that will satisfy the rapidly changing environment and the function of protection of the body in a range of conditions and, in particular, clothing with design features that may be adjusted when body temperature changes consistently. The Clothing research team considers the use of new textile technologies, such as phase change materials that adjust to heat or impact, as well as wearable technology to adjust the temperature difference. This research is also concerned with raising awareness of the environmental impact, in terms of sustainability, in textile selection and waste management.

1.1.3 Functional and expressive product aspects

Five product requirements identified are concerned with aesthetic, symbolic, functional, quality, and ease-of-use aspects. Research shows that older people, in buying durable products, pay more attention to three types of functional aspects, namely functionalities, ease-of-use and quality. (Creusen 2010) The problem is that, due to the rapid changes in technology, older users, or users of other ages, still have a lack of understanding of new textile technology and terminology. For example, in a ‘Clothing’ focus group looking at ‘base layer’ garments the definition of the garment ‘layering system’ (understood in the professional sportswear community) is barely known and is confusing to older research participants, with very little of the base layer’s function clear and understood. Older people were found to normally wear cotton underwear, and generally considered natural fibers to be superior to man-made fibers. This helped to make designers aware of the need for appropriate language and communication with older users. On the one hand textile experts and designers explore the possibility of new technical materials and the introduction of new products, while, on the other hand, there is the lack of channels for older users to understand and try out these new products. With a lack of updated information, the choice of products, by older people, is based solely on past experience. Training is required, with the research team together with older users, to help them to correctly determine the product performance and quality.
For the clothing styles, the old users can give their experience of everyday wear for the fit of clothing, sleeve length, collar height, collar, zipper length with clear requirements. However, because much product development, such as in the outdoor technical clothing market, rarely considers a design process that takes into account the characteristics and needs of older users. A lot of issues to do with clothing size, styling and details are mainly designed to fit the professional participants and can not completely meet the requirements of the old people.

1.2 The change of baby boomers in the UK and China

In Europe, people more than 55 years of age, known as ‘Baby Boomers’, born in the peak years, 1946-1960, went through the third scientific and technological revolutions in human history. One of the baby boomers, in a presentation at the Summer School at Tsinghua University, talked about the rich life experiences of the post-war baby boom generation, including 60's music, fashions such as the mini skirt, the first moon landing, world travel and many subsequent opportunities. (McCann 2010) This generation has experienced fashion and product design throughout their lives and will have higher expectations on products designed to suit their lifestyles. By 2020, the Chinese Baby Boomers, who were born in 1960s – 70s, represent a huge population that will enter old age. (Figure 1) This generation has experienced; the reform and opening of China, access to higher education and integration in the global economy. Under the influence of the older people in China, their expectations of clothing are different from the previous philosophy of life and consumption patterns, and they have a higher spending power for their higher consumption requirements. The new generation of large numbers of elders will not only affect China's overall spending power, of the older market, but will also put forward a new range of older user requirements to Chinese designers.

1.3 Different needs of Chinese older people

1.3.1 The demand of Chinese Symbolic Clothing for the elderly

Every traditional festival in China, such as Chinese New Year, Moon Cake Festival is usually related to a seasonal conversion. There is also an annual festival, within the Chinese agricultural calendar, dedicated to older people, the Chong Yang Festival. During such traditional holidays, the younger generation will need to buy clothes for their parents and or grandparents, which represents an important purchasing season in China. The younger generation when buying for the older people will need to consider clothing symbolism and the style of clothing; for example, when select clothing for Spring Festival, the main features that normally attract customers will be traditional decoration styles, with a blessing and a symbol of the meaning of long life.

1.3.2 Understanding of Colour in China

The choice of colour in older people' product consumption has been influenced by traditional Chinese culture. Natal year tradition in China, means this year, your life will be rough, unlucky, therefore on the first day of this Chinese New Year, you and all your
relatives, parents, spouses and kids are expecting you to wear red clothes, since Chinese people believe the colour of red in the new year can ward off evil spirits and bring you good luck. In China, when you are turning 60 years old, in the Chinese 5th natal year, called “Huajia”, the grand birthday celebration is very important in Chinese tradition as a symbol of a long life and good health. In this year, a “Huajia” old person will receive clothes and other accessories from his or her family members and friends, and these gifts will be in the symbolic colors-red, sometimes mixed with yellow, and in high quality. These gifts present the blessing from people’s heart, love and best wishes. When the first mobile phone specifically designed for the elderly in Beijing, May 2010, the color of red was selected; Chinese people believe red brings happiness and joy. Buying this red mobile phone, designed for the older people, soon became the top choice on the list of gifts to parents. (Personal market research, Beijing, 2010)

2 Clothing design methodology attempt for ageing

2.1 Design more or less

A great design not only is the design itself, but also depends on whether it fits customers’ needs consistently. Maybe we should not focus on designing a new image, but focus on adjusting and improving the existing design. We will need to reduce the speed of developing new design ideas to ensure that our design can truly achieve our design philosophy. This is a more responsible, sustainable in the design approach. Careful observation and understanding of older persons act in their daily lives, habits, their social activities, traditions and culture impact on them, should be the first step in the design process. In order to target the market of these groups, we should try difference approaches in research, methodologies and design practices. The ‘Design for Ageing Well’ project, at the University of Wales, is researching the concept of ‘Co-design’. Co-design is a more open design process that demands a new skill set and underlying philosophical approach from designer. User’s experiences and requirements play a more important role within the design process. The end-user’s participation in design is effective method and help designer to understand the needs of the targeted customers. The targeted customers were invited to participate in the design process, and through workshops, we found that the older users are more inclined to like simple and easy garments. They showed that they are interested in new fabrics and new technologies in design, specifically in base layer garment styling intended for cyclists such as a design, using a body mapping concept, that places different fabric qualities in different parts of the body for different performance properties. In a workshop on wearable technology, the older user group proposed that technology devices should have interface design with options that are simple, related to applications of interest, in health monitoring and information exchange.

2.2 Clothing design for ageing specific case studies on methods of ageing design consideration

2.2.1 ‘Feel good’ aspects: a balance of aesthetics and function
Environment conditions impact on comfort and the ‘feel good’ factor, with considerations that include seasonal requirements and whether the garment is intended for indoor or outdoor environment, or as a multi-purpose clothing system for a range of conditions (McCann 2009). In using her design concepts as a case study, McCann balances the functional and aesthetic style needs of wearers, in a garment layering system structured to include a range of styles for different figure types. This range is made up of base layer clothing, with moisture management, middle layer clothing with thermal regulation features, and outer layer protection, that addresses a complex variety of user-needs. The use of new materials and new textile technology has replaced traditional fabrics throughout the different garment layers that are adjustable to provide attractive and functional, lightweight and portable, quick-drying and warm, every-day clothing to meet the needs of the target users. (Figure 2)

Clothing fitness for purpose is a combination of aesthetic and functional features. It requires an appropriate balance of aesthetic concerns such as colour, silhouette, fabrication, cut, proportion and detail contributing to the psychological ‘feel good’ factor of the wearers (McCann 2009). The form and proportion of this clothing range offers a breadth of styles adapted to the changing needs of the body. Through the adoption of three-dimensional pattern cutting techniques, usually found in active sportswear developments, everyday clothing items have increased comfort and freedom of movement.

2.2.2 Colour and detail influenced by tradition and culture

The cultural characteristics of different regions and traditions have a great impact on garment selection. In different geographical regions, the meanings of colours vary. People of different cultures are comfortable with completely different favorite colors. For example, in the UK the lingerie market almost never uses red. In China, the colour red is an all time favorite colour and broadly used in winter base layer garments, especially for Chinese traditional zodiacal New Year culture. The meaning of red in the west represents emergency and danger, but in China red represents luck, happiness and beauty.

In the case study, discussed above, the inspiration for the colour selection also has strong regional characteristics. Many colours are from the Irish landscape, with references to rocks, plants and sea changes that may be mixed in harmony throughout the clothing range. The details of the styles represent influences from the local culture, identity and tradition, as well as offering choice to wearers. In this design case study, many details such as collar style, buttons and pockets are designed with traditional Irish elements. Traditional culture provides definition, meaning and individual identity, different from the frequent replacement of cheap high street products.

3 Argument for design for ageing and design education in China

The future consumer market will be more diversified than at any time in the past in terms of age range and, therefore, the physical ability of certain users (Inclusive Design Toolkit). Both the Chinese and UK designers need to consider inclusive design / design for all age
groups; young customers, middle age and elderly customers. In particular older customers should be brought into the mainstream with better design solutions. Both design practice and design education need to adopt a User-centred design theory. An understanding of Inclusive Design is important to the designers of tomorrow - and to those who educate them (Inclusive Design Toolkit).

3.1 How the future Chinese designers can be ready to face the challenge from the huge market demands?

By 2020, Chinese old people will reach a population peak representing 17.17% of the whole population. This group will have a remarkably strong purchasing power. The question is how the future Chinese designers can be ready to face the challenge from the huge market demands? Does the clothing design education in China be adopted for this changing?

The challenge from the manufacturing industry is the lack of qualified designers with the appropriate knowledge and skills for ageing design. The design educators must rethink education strategies and make necessary adjustments to the current system. In the next decade, the Chinese Baby Boomers, born in 1960's, 1970's will be in their 50s, representing an ageing consumer majority in the population. These people will be selective and wise customers with the highest purchasing power. They will raise the level of need, requiring us to speed up the preparation of design education. “Design for tomorrow” needs to be started today.

There are 900 universities in China that offer courses in art and design and 70% of them award degree level clothing design. There are 99,264 bachelors who have graduated with design degrees in 2009! Right now, based on the data from the China Education Ministry, 239,582 students are in the first year of Art and Design study, with 167,707 of these students studying Design. The number of graduate shows, in China, each year, has about 100,000 design major graduates who will join professional design teams.

China now has the biggest apparel industry in the world. However, China does not have its own globally famous apparel brands. With well developed clothing manufacturing technology and well equipped facilities, China produces high quality produces with low cost for many of the famous name brands from across the world. On the one hand, China owns a huge domestic apparel market, with high-level manufacturing and impressive young designers, but, on the other hand, it lacks famous Chinese brand names that are recognised in both local and international markets. This weakens the Chinese local clothing producers’ power of competing with the challenge from European and North American companies. “Made in China”, for foreign brands, has occupied the Chinese fashion market and other product sectors.

There are over 200 universities offering fashion design and clothing engineering training, but the clothing industry is still struggling to find professional designers with the necessary skills. There is, therefore, conflict between the numbers of design graduates available and the lack of suitably talented designers that meet the real needs of industry. The current skills that Art and Design graduates have cannot fully meet the needs of industry. This fact highlights disparity and misunderstanding between the academia and
industry. There are many arguments and experiments that have been conducted for the improvement of design education in China. What kinds of courses can we now offer to potential designers for the growing ageing society and how do we reform the design curriculums for the future? In China, there are well-established manufactures and markets, but designers and manufactures do not seem to realize the opportunities and challenges generated by the serious growth in the ageing population. A key change should be the introduction of Inclusive Design theory, based on user-centred design principles, to provide designers with a better understanding of all consumer needs and aspirations. Adoption of Inclusive design thinking and practice in education and course set-up in China will benefit future designers in China.

3.2 A lack of attention to User-centred in clothing design education

User-centred design philosophy has been generated within product design practice. The establishment of academic design courses in China has been separated from the real market needs. In clothing design, training has focused on the aesthetic value, appearance, effect, with only a little attention on the user's daily needs. There has been minimum concern on design and research into the functional clothing needs and characteristics for older people’s special needs. Although many universities set up design courses in the field of clothing design and clothing engineering, there is almost no exchange, discussion, and communication in fashion design education on how to teach students from a user-centred approach. Donghua University, for example, leads Fashion Design and Garment Engineering programs in China, with no communication between the subjects. Their Clothing engineering laboratory equipment is very advanced and only matched by certain universities in the UK. However, there is limited opportunity to develop real ‘live’ product and design projects with the manufacturing industry. (Interview with Prof. LiJun, Director of Clothing Design and Engineering, Donghua University, 2010)

In China clothing design training is divided in two directions, Engineering and Fashion. Fashion teaching follows the trend of catwalk shows, but ignores the needs of normal daily life. This situation is very common in both China and the UK. On the other hand, Clothing Design Engineering focuses on pattern making, the manufacturing process, but ignores the aesthetic factors. Students’ knowledge is not broad enough because of the separation in training, and it is difficult for them to have a comprehensive overview in their design practice. As a result, most students only focus on the appearance of clothing and cannot combine other design elements to meet consumer demands for a blend of aesthetic and functional needs.

3.3 New strategy for performance clothing design teaching methods

In the school of Art and Design, at the China Women’s University, we have recognised the need for functional clothing design training and I have been responsible for
developing and launching the first Sportswear Design Course in China, in 2004. 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. This ‘live’ project work, in collaboration with industry, to support design practice and teaching, has already achieved great results, of benefit to both students and industry. We are the first Clothing Design program in China to adopt this system. However, this functional clothing design education, with industry links, can be extended to design for special groups. The future designers from our college will consider the functional clothing to address the ageing clothing market demand.

Currently, user-centered design methods have not been recognized and applied in the field of clothing design elsewhere in China. A “user-centred” design philosophy needs to be introduced widely to Chinese clothing programmes, in order that our future designers will be able to put these ideas into their practice. Students should learn this new design process, as well as gaining an understanding of the performance of textiles, 3D pattern cutting for movement, human physiological responses and psychological impact etc., in relation to the design of both fashion and functional clothing ranges.

**Conclusion and discussion**

Understanding the needs and lifestyles of the new ageing market in China is the first step in the design process. A cross-disciplinary research methodology is at the core of academic design research and research into teaching, that will provide clear directions for the future designers. As China faces the peak of the age population boom, training of future designers has become an important research subject. Other important issues will be investigated and discussed in future design education planning, such as following:

1. Demographic data should be more diversified and plentiful to provide more detailed information for designers regarding end users and their needs. China still lacks such research, with data collection and analysis superficial and not reflecting the actual problems. (The Inclusive Design Toolkit may provide guidance in analysis of data to help designers understand the characteristics of users and markets.)

2. Co-design theory and methods will need to be developed with more practice and experiments to be done in the field. This will involve more techniques such as how to research the end users real needs, how to analyze the conversations, and descriptions recorded, and how and when end users can participate in the design process.

3. The practice of cross-disciplinary research and teaching will need time to develop because it challenges the boundaries of existing disciplines and teaching management restrictions. Researchers with different background and experiences will need to work together and overcome these boundaries to find a common shared language in design for aging. In the field of the management, systems must be adjusted to support this cross-disciplinary model of teaching and research.

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Figure 1: Chinese baby boomer golden age and retired age date

Figure 2 McCann's design works details
**Human Nodes - Relevance for Inclusive Design and Social Innovation at urban slums in India**

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**Abstract**

In the underdeveloped sections of complex societies like India, exclusion can have multiple dimensions. Considering the large number of affected individuals by the lack of access to possibilities of good living this section of society should be included in the target of inclusive design [1] along with people with disabilities and advanced age. In this paper we present a research grounded in the theoretical framework of community informatics [2] and based on an ethnographic study done in Sudarshan Layout, an urban slum in Bangalore, India. The local community of Sudarshan Layout faces exclusion due to economic hardship, stigma of low caste birth, illiteracy and hence little access to digital technology. The life of these people however thrives through local social networks comprising of various social groups. This paper discusses three such social groups i.e. Local Shopkeepers, Volunteers and Community Leaders termed as *human nodes* of Community Communication at Sudarshan Layout. In this paper we argue that the *human nodes* should be engaged and considered for any inclusive design approaches for marginalized communities like those in an Indian Urban Slum. We further argue that by including *human nodes* in Inclusive Design initiatives, Social Innovation can be addressed.

**Keywords**


**Introduction**

The present article is based on findings of an ethnographic field research conducted at Sudarshan Layout, an urban slum in Bangalore, India in February 2009. The field study was part of first author’s recently completed master’s thesis [3]. The thesis investigated
the area of mobile phone based community communication for marginalized communities belonging to Indian urban slums.

This research is grounded in the framework of Community informatics (CI). De Moor [2] describes Community informatics as a branch of study based on community and technology. Community informatics is focused towards utilizing this ‘social context of technology use’ to develop tools for empowerment of a community. Many Community informatics researchers have argued for designing innovative solutions within the available technological infrastructure and grounding the design in existing local practices of the community [4, 5, 6]. We find that this approach is also useful in the practice of Inclusive design to support social innovation in marginalized communities of Indian Urban Slums.

This participatory research was conducted in collaboration with AC3 Members, a group consisting of local youth of Sudarshan Layout. Ethnographic Action Research (EAR) [7] and Participatory Rural Appraisal (PRA) [8] have inspired the methodological approach followed in this research. EAR is the research approach to study impact of Information and Communication Technology (ICT) especially in the area related to poverty alleviation [7]. PRA is a research methodology which advocates bottom-up research approaches with flexible and innovative mix of various methods and sensitivity for the local context [8]. The research methods employed for this study were: participant-observation, field notes, group interviews, in-depth interviews, social map drawing exercises and self-documentation through camera exercises.

In this paper we present three groups of local actors, namely, local shopkeepers, volunteers and community leaders that we term as human nodes of community communication at Sudarshan Layout. The human nodes are informally and voluntarily engaged in playing significant role in the context of community communication because of their social relationships and trust they build with the local community of Sudarshan Layout. In this paper we argue that the human nodes should be engaged and considered for in any inclusive design approaches for marginalized communities like those in an Indian urban slum. We further argue that by including human nodes in Inclusive Design, Social Innovation could be addressed as the human nodes form the functioning informal network which is strengthened by the values of trust, mutual concern, social bonds and strong relationship with the local community.

India, Bangalore and urban slums
India, world’s largest democracy, amounts to 17% of world population and includes one-third of world’s poor [9]. According to the last Census [10], India’s overall population was 1027 million, out of which 285 million (27.8 %) lived in urban areas. This research is based on ethnographic field study conducted in Bangalore city. Bangalore is located in southern part of India and is the capital city of state of Karnataka. Bangalore has a population of over 6.5 million and is ranked fifth most populous city of India [11].

It is widely accepted that ‘slums’ are difficult to define and there are multiple definitions and meanings co-existing [12]. According to UN-Habitat [13]:

“Slums are distinguished by poor quality of housing, poverty of inhabitants, the lack of public or private services and the poor integration of the inhabitants into the broader community and its opportunities.”
Approximately 924 million people, 31.6% of the world’s urban population, lives in slums. 67 million of the urban population of India lives below poverty line. This translates into people living on less that US$ 2 per day [9]. Urban Slums are marginalized and accommodate the most disadvantaged group of urban dwellers. Much of the labour force in cities of developing countries lives in slums [13]. Similarly, Sudarshan Layout fits the above mentioned UN-Habitat’s description of ‘slum’. This settlement is discussed in detail in the next section.

Definitions

Taking inspiration from the discourse of Inclusive Design, Ornelas and Gregory [14] have argued for Design for Social Inclusion that focuses on utilizing local resources and "richness of communities" in designing services and products which are relevant and grounded in the local social and cultural context:

“Design for social inclusion is about tapping into the richness of communities and the use of local resources in conjunction with entrepreneurial activity and industry to develop products and services that are intrinsically related to social and cultural contexts while also viable and relevant in national and international arenas." (p. 4530)

Extending the above, our definition of Inclusive design in the context of this study is: a design intervention that includes socially, economically, politically, physically, age-related marginalized sections of a society to provide them the access to possibilities that the society offers to normal citizens. Similarly, social innovation for us is the space that can be created for new possibilities in a local social and cultural context. This way social innovation has two dimensions. One is that it is a positive intentional change in the social practices, and secondly it necessitates the participation or even leadership of local actors.

Some of the dimensions of social exclusion that we highlight here are observed in other places as well. Silver [15] discusses the exclusions of the new poor as a result of economic restructuring. A report by the Social Exclusion Unit of the office of Deputy prime minister of UK in 2003 finds social exclusion as a result of transportation infrastructure [16]. Social exclusion theory considers social exclusion as a prime cause of poverty (1994 study of International labour review) [17]. Often these exclusions are found to be a result of global influences on local systems [18]. In the case we studied these multiple exclusions are cemented into a social structure by the spectre of Indian caste system. In the following sections we discuss the case of Sudarshan Layout, an urban slum in Bangalore and the multiple dimensions of exclusion that we are referring to in this paper.

Sudarshan Layout and multiple dimensions of exclusions

This research is based on ethnographic fieldwork conducted in Sudarshan Layout, an urban slum in Bangalore, India. Sudarshan Layout is a residential area for the (marginalized) community of construction workers, domestic helps, labourers all belonging to scheduled castes (SC). As recognized by Indian constitution those listed
under SC are the castes which need to be granted reservations in government policies in order to enable them to overcome their historical and contemporary deprivation. The local residents identify themselves as *dalit*, a self-designation for people belonging to lowest of the castes in Indian caste system. *Dalits* have suffered prolonged social discrimination due to their lower caste birth.

Sudarshan Layout is roughly a hundred meters in length and fifty meters in width. Approximately three hundred families live in over one hundred and fifteen houses, most of which are one-room tenements. Big corporate office buildings surround the area and a big sewer-line runs by one of its boundaries. The family income of inhabitants varies between Indian Rupees (INR) 1500-10000 (40-150 Euros) per month. The local population falls in the low income group category in the Indian context and residents define themselves as belonging to the category of below-poverty line (BPL). They get food and items of regular use at subsidized rates from government’s ration shop. The nearest ration shop is 15-20 min. of walking distance from Sudarshan Layout. Most of the houses in Sudarshan Layout do not have toilets and fresh water taps. The local residents use a public toilet which has eight WCs. Four are them are for men while other four for women. There are three fresh water taps, one each on three of the streets of Sudarshan Layout which provide fresh water for the entire community.

The older residents of Sudarshan Layout migrated from rural areas of Karnataka and nearby states like Tamil Nadu, Kerela and Andhra Pradesh over a period of thirty years to settle and work in Bangalore. This group consists of individuals who dropped out of school to work at a very early age and many of them are illiterate. In contrast, the younger generation of Sudarshan Layout was born in Bangalore and many of them completed basic schooling.

Sudarshan Layout has regular electricity supply but persistent voltage fluctuation hampers use of electronic equipment. Almost every household in Sudarshan Layout has a television set and DVD players are very common as well. The mobile phone is the most pervasive communication device in Sudarshan Layout. Very few households have land line phone connection. None of the families in Sudarshan Layout owns a computer and similarly none of the households has an Internet connection.

As we can see from the above details the members of this community belong to a historically discriminated class and their suffering even though reduced in last few decades has not yet ended. The Sudarshan Layout residents, have been a part of the labor force of Bangalore but still have to face multitude of exclusions spanning social, economic, civic, political dimensions due to caste issues, poverty, lack of education, illiteracy to name a few. The residents are living in the city but still in an area demarcated and excluded from civic amenities including security. Their income is not sufficient to enjoy the resources that society possesses. Their access to education is underprivileged. The stigma of caste is an obstacle in their search of livelihood. Even very basic facilities, like proper drainage of waste, needed for urban living is denied to the local population. Nevertheless the community thrives as a lively neighbourhood sharing each other’s joys and sorrow. Through their internal networks and external connections they muster resources to increase their possibilities of better livelihood and deal with multiple exclusions. Hence, we argue, that these networks provide spaces for social innovation which should be considered in Inclusive Design approaches for marginalized communities like those in an Indian Urban Slum dealing with multiple
dimensions of exclusions. Next we describe an exemplar of such an initiative coming from within the community.

![Figure 1: Sudarshan Layout](image1)

![Figure 2: AC3 Members and AC3 Students](image2)

Ambedkar Community Computing Center (AC3)

Ambedkar Community Computing Center (AC3) is based in Sudarshan Layout and it is described by the residents as an informal computer education center for children of slums. The idea of AC3 was conceived during a meeting of local youth of Sudarshan Layout with Stree Jagurati Samiti (SJS), an NGO based in Bangalore, and Ambedkar Youth Association (AYA), a local youth association of Sudarshan Layout. The local youth aspired for computer education and during the meeting they expressed their aspirations. AYA agreed to provide space to start a computer center while SJS contacted Association for India's Development (AID) with request for teachers. Association for India's Development (AID) is a group of volunteers primarily software professionals working in Information Technology industry of Bangalore. Various Sudarshan layout residents volunteered and helped in building the necessary infrastructure to start the center. A self-organized group, whom we refer as ‘AC3 Members’, consisting of members of local youth of Sudarshan Layout volunteered to take the responsibility of the computer center. Finally, AC3 was formally inaugurated on 6 July 2008. AC3 follows a layered and community oriented approach of teaching i.e. the AID volunteers teach the AC3 Members while AC3 Members teach the younger children from Sudarshan Layout. AC3 is a bottom-up initiative owned and managed by the local community. AC3 fulfils our definition of social innovation as it creates new space for education and learning for the local youth and children within the local social and cultural context. AC3 is also an exemplar of how through the existing internal networks and external connections local community muster resources to deal with multiple exclusions limiting the educational possibilities. Proceeding from this we present and discuss human nodes of Community Communication at Sudarshan Layout in the next section.

Human Nodes of Community Communication

In this section we discuss three social groups which play crucial role in the context of community communication in Sudarshan Layout. We term these social groups as human nodes. The term human node was proposed by the first author in his unpublished master’s thesis [3]. Three types of such human nodes identified at Sudarshan Layout are
community leaders, local shopkeepers, and volunteers. Some of these human nodes like community leaders and local shopkeepers are residents of Sudarshan Layout or other similar urban slums while others like volunteers belong to more privileged section of India society. The relationships of these human nodes with the local community enable them in playing a significant role in community communication at Sudarshan Layout. Their bonding with local residents continuously engages them in doing so. The trust that local residents have in them brings mutual accountability and responsibility to do so. These human nodes play a role in the community communication usually without consciously being aware of it. The significance and existence of human nodes finds support from some of the recent findings:

- Sambasivan et al. [19] informs role of ‘human mediators’ in access to technology among members of local community in an Indian Urban Slum.
- Watkins et al. [20] acknowledge the role of ‘human intermediaries’ in DakNet initiative in rural India.
- Jones et al. [22] acknowledge the importance of engaging Non-Governmental Organization (NGO) members in creation of audio visual data in rural India.

All the above mentioned cases highlight role of certain human actors like human nodes in our case, playing crucial role in variety of contexts relevant to the local community. In the following sub-sections we discuss each type of the identified human nodes i.e. community leader, local shopkeeper and volunteers.

Volunteers as human nodes
Discussion on volunteers here refers to members of AID, SJS and some other independent volunteers. Volunteers belong to privileged section of Indian Society. All of them are educated, working professionals and belong to Indian Middle Class. Interaction of AC3 Members with AID volunteers consists of evening classes. At the time of this research, these classes were held for one hour per day and five days per week. AC3 Members and other groups from Sudarshan Layout trust and respect these volunteers while volunteers act with responsibility.

AID volunteers are well informed and concerned about the regular happenings in AC3 and Sudarshan Layout. Regular conversation of AC3 members with the AID volunteers consist of casual chat, informing volunteers about daily events, and discussion on AC3 and computer education. AC3 Members inform volunteers of any unfavourable event in Sudarshan Layout. These volunteers serve as mediators of information access for residents of Sudarshan Layout addressing the local needs and overcoming the physical, economic, political or social constraints. Two such instances:

AID Volunteer: “Sarsu’s [AC3 Member] friend wanted some document about AIDS. So she called me and said that she needs some documentation on AIDS can you bring some? I was in office. I browsed web, took some printouts and gave them to her in the evening. And she [Sarsu’s friend] got second prize in the talk.”

AID Volunteer: “Recently they [AC3 Members] came to my house to learn on astronomy. We had a nice class on astronomy and we were using Internet to search for images of stars...”
Apart from above mentioned role as mediators of information access, volunteers also inform the residents of events outside, supporting locals in their problems, and spreading local information to the outside world. In case of Sudarshan Layout the strength of relationship between local community and volunteers assists in community communication and engages volunteers as *human nodes*. Please see Figure 3, a representation of AID volunteers as *human node*.

**Community Leader as human node**

Community leader of Sudarshan Layout i.e. head of Ambedkar Youth Association (AYA) plays an important role in community communication in the context of local problems. Community Leader and other members of AYA are residents of either Sudarshan Layout or other similar nearby slums. Community Leader is usually the first person to be contacted by local group to address any issue concerning the community. Face to face mode is preferred over any mediated channel i.e. a group of residents meet the community leader and discuss the concerning problem. Depending on the context of the problem, the community leader communicates and registers complaint with the concerned government organization like Municipal Corporation, police etc. Community Leader also shares the information with NGOs active in the area and other similar local community associations of nearby slums. One of the important reasons for the locals to share their problems with community leaders was that these leaders were accepted as transparent, trust worthy and part of the community. Trust and relationship of locals in the community leaders play a significant role in this respect. Significance of notion of trust in communities belonging to Indian Urban Slums has also been acknowledged by Sambasivan et al. [19]. In this way, the community leaders serve as *human node* in community communication concerning local problems with the world outside slums. Please see Figure 4, a representation of community leader (AYA’s head) as *human node*.
Local Shopkeepers as *human nodes*  
Sudarshan Layout has a few small shops like a road-side tea stall, a bakery and few small multipurpose shops. AC3 Members and other Sudarshan Layout residents are regular visitors to these local shops. The shopkeepers are residents of Sudarshan Layout or similar nearby slums. The shopkeepers are not just interested in selling goods but are interested in everyday life of locals as well. The relationship involves concern for each other, information sharing and trust. As also explained by Sambasivan et al. [19]:

"...the notion of trust in maintaining stable livelihoods was built into the numerous everyday social livelihoods and was renewable and regenerative process through constant social interactions."

During the short stay at these shops, residents of Sudarshan Layout interact with the shopkeepers. This communication will deal with sharing of information. Information sharing can vary from a trivial matter like current cricket scores to grave issues like a theft in the locality. This informal mode of information sharing spreads local information and contributes to community communication. In this way, local shopkeepers serve as a *human node* in the community communication. Please see Figure 5, a representation of local shopkeepers as human node.

![Figure 5: Local Shopkeepers as human node](image)

As we see from above that *human nodes* form a functioning informal network which addresses various needs of the local community of Sudarshan Layout. This informal network become safety nets bringing them some financial security invokes social security and informally addresses various informational needs of the local community members. The *human nodes* through elements of trust, social relationship, and mutual concern play significant role in reduction of the multiple dimensions of exclusions the local community has historically faced. This is a ready framework for social innovation which can be utilized by inclusive design approaches by engaging *human nodes*. The local networks built around the *human nodes* create the possibilities for inclusive design; it is this way that an underprivileged community tries to recover from its unfortunate situation. Inclusive design can and should follow this lead and contribute to the same space of possibilities rather than making an external intervention. The emergence of AC3 is a significant pointer in this direction. The need for digital education arose from the local youth of Sudarshan Layout, who have been deprived of it in their basic schooling. But with support of various social groups and the active role of *human nodes* the computer center for children of slum came into existence. AC3 represents a social
innovation or space which facilitates the local population to access the possibilities of digital education.

Hence we argue that the human nodes should be engaged and focused on for any inclusive design approaches for marginalized communities like those in an Indian Urban Slum. The human nodes can facilitate the proposed service by incorporating their relationships, trust, context awareness, bonding, practices, concern for local community and their existing dynamics of engagement with local community being a 'node' in community communication.

Conclusions

In this paper we presented a research grounded in the theoretical framework of community informatics and based on an ethnographic study done in Sudarshan Layout, an urban slum in Bangalore, India. The local community of Sudarshan Layout faces multiple dimensions of exclusion. We described an exemplar of Ambedkar Community computing Center (AC3), a bottom-up initiative owned and run by the local community.

We discussed three social groups i.e. local shopkeepers, volunteers and community leaders as human nodes of Community Communication. The human nodes are informally and voluntarily engaged in playing significant role in context of community communication because of their social relationships and trust with the local community. We argued that the human nodes should be engaged and considered for any inclusive design approaches for marginalized communities like those in an Indian Urban Slum. We further argued that by including human nodes in Inclusive Design, Social Innovation can be facilitated as the human nodes form the functioning informal network which is strengthened by the values of trust, mutual concern, social bonds and strong relationship with the local community.

Acknowledgement

We express our sincere thank to the following individuals, groups, and organization for their support in this research: Association for Promoting Social Action (APSA), Stree Jaguruti Samiti (SJS), Association for India's Development (AID), Ambedkar Youth Association (AYA), Ambedkar Community Computing Center (AC3), Public Affairs Center (PAC), MARRA, residents of Sudarshan Layout, and the staff of Media Lab Unit of Aalto University School of Art and Design.

References


Oficina da Ciranda, a social and sustainable technology case.

Tulio Maximo, Erika Foureaux and Instituto Noisinho da Silva team

Instituto Noisinho da Silva

Abstract

Ciranda seat is an assistive device to support children between the ages of 0 to 6 to sit independently and to welcome any children, disabled or not, to approach and play, on it or around it. The project is divided in one social assistive event, on which families who cannot afford the seat are supported to produce one, and another commercial version, which fundraises and maintains the social project. Ciranda seat project is a succeeded social business technology awarded by Unicef which already benefitted 640 disabled children and created 4096 multipliers.

Keywords

Inclusive design; assistive device; sustainability; social business; social technology; postural rectification; floor seat.

Introduction

According to the World Health Organization, WHO [1], children learn to sit without support between four and nine months. For many physically disabled children this is not a reality. The causes vary which each disability, common cases being in cerebral palsy, myelingomeningocel, multiple disability and others.

To support these children to sit properly an assistive device is used. This device is known as floor chair, floor seat or corner chair and corner seat.

“Special seating can be an important rehabilitation technology if it helps a disabled child to sit in a more self-controlled, more comfortable position, or if it enables her to do more things or learn new skills. However, in many programs you will see special seats that do more harm than good. The problem is not lack of concern. Often a lot of time, energy, and care have gone into making the seat.” [2]

These programs Werner [2] quoted are social attendance activities and rehabilitation programs whereby this sort of assistive device is produced. This is a typical case in countries where this sort of device is not available in the market, such as Brazil.
This article will not broach the problems most special seats have, these are well discussed by Werner in the chapter *A Child is Not a Sack of Potatoes* [2]. It will focus on one successful initiative from Instituto Noisinho da Silva (INDS) which created a project that provides effective solutions to the disabled floor seat problems\(^1\) and also provides that the widest range of Brazilian disabled children could take advantage of this equipment benefits. To create an accessible solution to all social classes the Institute created two projects: one commercial floor seat called Ciranda; another floor seat version, solely for the benefit of the disfavoured classes, called Oficina da Ciranda (OC).

**The Instituto Noisinho da Silva**

The INDS is a non-profit organization the aim of which is children’s social inclusion, disabled or not, through product and project development and educational, cultural and attendance activities, informing the public of the importance of these activities and projects for the inclusion process and children’s wellbeing.

**The Ciranda concept**

The name Ciranda comes from a traditional Brazilian play where people give their hands to play, forming a circle, or a ciranda. More than just an assistive device to support children between the ages of 0 to 6 to sit independently, the Ciranda seat concept is to welcome any children to approach it and play, on it or around it.

In his book *design meets disability* [3] Graham Pullin discuss the importance of the mainstream design approach the design for disability.

"In design for special needs, mediocrity can result in people being further stigmatized by the very products that are intended to remove barriers for them, thereby undermining the highest goal of social inclusion." [3]

Ciranda project’s purpose is exactly to design products more than functional but with successful mainstream design approach.

**The Oficina da Ciranda(OC) project**

The OC project was designed to benefit physically disabled children who cannot sit well independently and also to coordinate their families, parents and responsible during the Ciranda seat production. This postural rectification equipment allows the children minimum trunk control and to sit safely and comfortably on the floor. This will promote use of the floor as a learning and entertainment environment, typical at their ages, but not real to their abilities. This makes this rectification equipment an important inclusive tool.

\(^1\) Without marketing purpose but committed with the real children’s requirements.
While the parents produce the Ciranda seat, their children, including brothers, sisters and the disabled children’s close friends are evolved in inclusive, cultural and entertainment activities supported by INDS professionals and local institution caregivers.

**The OC children selection**

Firstly, the INDS contacts the local Institutions which support the physically disabled children of a determined region. The physiotherapists of these Institutions are asked to fulfill an INDS’s standardized form with details and anthropometric data of each child the Ciranda seat can potentially benefit. Following the OC event, a multidisciplinary INDS’s team investigates each child besides the family and the local institution professionals, selecting the children who, indeed, the Ciranda seat will benefit and not damage.

**The OC event**

The OC is a two days event and requires basically a carpentry structure, where the Ciranda seat is produced, a space to develop the children entertainment activities, a nursery and a dining hall. Most times the local institution which supports the disabled children has this complete structure. When there is no carpentry a partnership is made with a Brazilian government technical school call SENAI / SESC which has all the structure needed. When convenient, the nearest carpentry available is contacted.

<table>
<thead>
<tr>
<th>OFICINA DA CIRANDA TIMETABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>OC day</td>
</tr>
<tr>
<td>day one</td>
</tr>
<tr>
<td>8.30 to 9 am</td>
</tr>
<tr>
<td>9 to 12 pm</td>
</tr>
<tr>
<td>12 to 1 Pm</td>
</tr>
<tr>
<td>1 to 5 pm</td>
</tr>
</tbody>
</table>

2 In Brazil it can be the institutions APAE, AACD, AMR and many others depending on the region.
The OC seat production

At the carpentry the family members, or friends responsible for producing the seat, receive a kit containing the material to use during the event and a manual, explaining the process, tools and safety guidance required to produce the seat, in case they have to repair or construct the equipment for other disabled children.

They are given a first basic instruction about safety and techniques. Then they are directed to workbenches where the first piece of the seat and the safety equipment are set. The work is always accompanied by INDS trained professionals. More pieces of the seat are delivered during the day, although only when all groups finish the same piece. If a family finishes earlier the INDS professionals directs that family to help a slower one.

Figure 1. Different stages of the Ciranda seat production.

The cultural and entertainment activities

The cultural and entertainment activities are divided in groups according to child age. All the activities are directed to include the disabled children and are made by a local professional entertainer, INDS trained professionals or by the local disabled children’s institute if approved by INDS as an inclusive entertainment.

Figure 2. Different stages of the cultural and entertainment activities.
The commercial version of Ciranda Project

The commercial version of the Ciranda seat was developed to support disabled children’s families in broader and specific needs, such as: the possibility to use the seat to support the bath throughout attachment of suction cups and use of waterproof materials; seat in a higher position throughout attachment of seat legs; easy transport the seat throughout dissembling it and carrying in a special backpack. The commercial version can be easily adjusted to different children’s size, being ideal for disabled children’s institutes, clinics or schools.

The project methodology

To succeed the children’s, parent’s and medical professional’s approval INDS utilized a user centered design approach and a multidisciplinary team, composed by an occupational therapist and a physiotherapist supporting the product development team, composed by mechanical engineers, product and graphic designers. This team was led by INDS’s Director Erika Foureaux.

INDS conducted a market research to appoint strengths and weakness of similar devices in the international market, comparing nine of them. The common weakness of the devices analysed were:

- High cost of the devices. Average of 378 £ sale’s price.
- Medical appearance. Lack of playful, child designated appearance.
- Use of straps giving a tie connotation.

Due to the lack sources of disabled children anthropometric data, especially from Latin America and Brazil, INDS led field research to collect anthropometric data, interview the disabled children’s families and institutions, and observe their solutions about floor seating. About 370 disabled children and their families were visited, interviewed and the anthropometric data collected in the Belo Horizonte city and surroundings, in Brazil. The data were analysed and processed in an ergonomic package to the seat design, attending the different disabilities requirements and different children’s sizes. Beyond the anthropometric measures the research raised the following requirements to the Ciranda seat design:

- Let the superior members free to encourage activities realization.
- Provide pelvis establishment.
- Provide a confortable and safety sit.
- Diminish the inferior members’ tonus.
- Create a product that do not tie but hold the child.
- Create a ludic product without medical device appearance.
- Include the widest range of children at local communities.
According to the INDS president, Gezica Valadares, post-PhD in sociology and philosophy, the OC project methodology is a kind of participative project where: - ‘To include these children is to think in their parent’s inclusion in the process, because they are a great inclusion agent. Bringing these parents to OC seat production is the project solution to their inclusion’. [4]

“If others in the environment do not support the usage of the technology, the individual faces greater challenges to successful use of the device” [5]. The disabled children’s family and friends involvement in the Ciranda seat production is one of the strategies to enhance their support at Ciranda seat daily usage.

Another important aspect is the multiplier methodology, whereby the parents are trained and certified to reproduce the seat or even to fix their own chair if necessary without the INDS support. This methodology matches the project goal to include the widest range of Brazilian disabled children in a faster way. The INDS team also interviews some families in different months after the event to assess the children’s development and the project efficacy.

The commercial seat project uses a social sustainable methodology, directing the product profits to the production of new OC events and new product development at INDS, looking to enhance customer’s sense of inclusion by contributing to new projects through the product purchase.

The project delivered goals

The OC project has directed benefit 640 disabled children with Ciranda seats, 2560 family members participating at the OC event and 1536 professionals and persons involved at the OC event. There is total of 4096 multipliers of this assistive device.

According to Luis George, one of the APAE’s physiotherapists reporting to a news correspondent: - ‘due a bad posture these disabled children acquires many breathing and postural problems...’ ‘The Ciranda seat comes to enhance these children’s life quality throughout physical, mental and social welfare’.

These physical and also health benefits are breathing, gastric and orthopedic enhancement. The mental and social benefits are clearly the child’s socialization with other children.

The playful appearance of Ciranda seat is an attractive to all children approach. During the commercial version’s prototype trials and OC events the disabled children’s siblings and friends intuitively approach the seat to experience it, sit and play.

The Ciranda seat was developed considering the different requirements of a disabled child and their families. However, it can be perfectly used by a non-disabled child due the saddles which support the trunk control are detachable and the looping handle to
support the upper body can be adjusted or even removed if necessary, becoming a floor seat for any children.

Figure 3. The Oficina da Ciranda seat and the commercial Ciranda seat.

Conclusion

The OC and the commercial Ciranda are good examples of an inclusive initiative, attending to a real social demand through product and project development. However, the project just could happen with external sponsors and volunteer work due INDS is a young non-governmental organization. The sales profits are still being used to pay costs not covered by sponsors.

A good response to the sustainable efficacy of this project is the high demand of INDS’s products, required by private institutions, social institutions and by the government. INDS is now planning a new strategy to attend this demand and looking for new sponsorship to develop new Ciranda seat’s Moulds.

References


Internet


Towards Inclusive Design: the Picture in China

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Abstract
China has come into an ageing society since the beginning of the 21st century. At present the proportion of over 60s in China rises to reach about 13% of its whole population, and in 2030 this will increase to 24%. As a developing country, China’s progress in disability areas lags behind that of its social and economic development, but great efforts have been made in improving the welfare of people with disabilities in the past two decades. In 2008, the revised laws on the protection of persons with disabilities entered into force. In the meantime, a number of the government’s design codes have been developed to improve the accessibility in urban areas. Based on a literature review, this paper outlines the context of China towards a more inclusive future. Proposals were made to build a knowledge base of inclusive design for China, covering the areas of building theoretical models, compiling user data, collecting and creating best practice exemplars, developing methods and tools, and informing policy and standards.

Keywords
China, ageing population, disability, Inclusive design, knowledge base

Introduction: context
China is probably the best test bed for the business of inclusive design because it has the largest population in the world, of which a large proportion constitutes people with various disabilities. It has a fast increasing ageing population. In recent years, the numbers of design graduates and design enterprises are both increasing significantly.

Ageing
China becomes an ageing society from the beginning of the 21st century. Ageing population has been increasing year on year. In 2009, the over 60s constitutes 12.5% (total number: 165, 14 million) of its population [10]. It is predicted that by 2030, China will have 24% of the 60+ in its population. Similar to the western countries, there is a trend of a fast increasing ‘old-old’ (i.e. people over 80s) population [3] in China. In big cities such as Shanghai, ageing has already become a significant factor influencing its social and economic development.
Disability
According to the 2\textsuperscript{nd} National Sample Survey on Disability conducted in 2006, there are 82.96 million people with various disabilities in China, 6.34\% of its population \cite{1}, almost equal to the sum of the total population of Britain and France. Members of families with disabled persons account for around 260 million, nearly 20\% of the total Chinese population \cite{2}. Table 1 summarises the percentages of people with different types of disabilities within the population of disabled people.

<table>
<thead>
<tr>
<th>Physical disabilities</th>
<th>29.07% (24.12 million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hearing disabilities</td>
<td>24.16% (20.04 million)</td>
</tr>
<tr>
<td>Multi-disabilities</td>
<td>16.30% (13.52 million)</td>
</tr>
<tr>
<td>Visual disabilities</td>
<td>14.86% (12.33 million)</td>
</tr>
<tr>
<td>Psychiatric disability</td>
<td>7.40% (6.14 million)</td>
</tr>
<tr>
<td>Intellectual disabilities</td>
<td>6.68% (5.54 million)</td>
</tr>
</tbody>
</table>

As a developing country, China’s progress in disability areas lags behind that of its social and economic development, but great efforts have been made in improving the welfare of people with disabilities in the past two decades. Three pieces of laws and regulations have come into force since 1990, covering 1) protection of people with disabilities, 2) education, and 3) employment of people with disabilities. A number of the government’s design codes have been developed to improve the accessibility in urban areas, including:

- Design Code on Accessibility of Road and Buildings in Urban Areas
- Standards on Accessible Facilities and Equipment at Civil Airports Terminals
- Design Code on Accessibility of Special Schools
- Design Code on Accessibility of Railway Stations

During 2006-2010, the government plans to improve accessibility in 100 large and medium-sized cities. The work on ICT accessibility is also moving ahead steadily \cite{1}.

Design
Design, in its various forms, is taught in more than 200 universities and colleges (over 800 departments/schools) in China. According to the Chinese Ministry of Education, in 2010, there are 1.13 million students studying art and design at a higher-education level.

In recent years, universal design/inclusive design has started to be introduced to design curricula in some universities (e.g. Beijing University of Science and Technology, Tsinghua University and Tongji University).

A few initiatives on inclusive design took place in the last three years, for example:
- The 48 Hour Inclusive Design Challenge in Hong Kong (2008)
- The inclusive design Summer School at Tsinghua University, Beijing (2010)
- The inclusive design workshop involving NGOs at Tongji University, Shanghai (2010)

However, these initiatives have not had a wider impact beyond those participants.

In terms of design practice, there are a few local companies with successful inclusive designs on the market, for instance the Beijing-based design consultancy LKK
The author asked her Chinese postgraduate students to write case studies on inclusive design, and there are a few good local case studies identified; an example is shown in Figure 1.

![Figure 1. The IF-award winning SciPhone (case study credit: Shijiao Li)](http://www.lkkinnovation.com/)

**Research**

There are also papers and dissertations on the topic. For example, a search of dissertations on the topic of universal design on a popular database (http://www.cnki.net/) has resulted in 60 ‘excellent’ masters’ dissertations. An analysis based on the title and abstracts suggest the following research foci (Table 2)

<table>
<thead>
<tr>
<th>Areas</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial design (home appliances, information and communication products, personal hygiene products for bathrooms, public facilities, transportation products; with discussion on business strategies)</td>
<td>25</td>
</tr>
<tr>
<td>Environmental design (out-door public space, kitchens and bathrooms)</td>
<td>13</td>
</tr>
<tr>
<td>Architecture design (housing, museums, public libraries, school/university building)</td>
<td>12</td>
</tr>
<tr>
<td>Communication and interaction design (signage in hospital and public transportation, interface design)</td>
<td>10</td>
</tr>
</tbody>
</table>

The dissertations can also be grouped according to the beneficiaries specified (Table 3)

<table>
<thead>
<tr>
<th>Beneficiaries</th>
<th>Severe disability</th>
<th>Medium disability</th>
<th>Mild disability</th>
</tr>
</thead>
<tbody>
<tr>
<td>All*</td>
<td>40</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Physical disabilities</td>
<td>1</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>Learning disabilities</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older people</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary disability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left-handed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>40</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>
As shown in Table 3, there is a tendency to treat all the people with disabilities and older people as one group, and studies on specific groups tend to focus on people with severe disabilities.

Gaps in the knowledge base

A synthesis of western literature on inclusive design [4,5,6,7,8,9] helps identify the key elements of the building blocks of the knowledge base:

- Theoretical models (e.g. design process and knowledge transfer)
- User data (e.g. different types of users, capability and contextual data)
- Best practice exemplars (e.g. design, business, education)
- Methods and tools
- Policy, standards and guidelines

Despite the encouraging progresses made in China, however, there are gaps in the knowledge base of inclusive design. For example, current research tends to focus on end-user groups, but lacks attention to designers which resulted in the lack of effective knowledge transfer models. There are very limited user data for inclusive design; existing data only cover statistics of the ageing population and disability, and outdated anthropometrics data. There is still a lack of successful design and business case studies. Few designers have been through systematic training on human-centred methods and tools. Although policies and guidelines are in place in many cases, their effect and impact on practice are extremely limited. For example, the lead author organised five groups of students to audit the 11 lines of the Shanghai metro system during December 2010-January 2011, and found that none was barrier-free. Poor implementation of the guidelines, poor coordination and management made it almost impossible for any person with severe disabilities to use the system independently.

How to plug the gaps?

Based on many years of research experience on inclusive design in the UK and the preliminary investigation of the context in China, the author makes the following proposal to help plug the knowledge gaps:

- Theoretical models
  Conducting research to explore design process models and knowledge transfer models useful in the Chinese context, with special attention to designers’ needs

- User data
  Collecting new user data and building up user databases based on in-depth understanding of designers’ needs and preferences
  Conducting multidisciplinary research on integrating different types of data for use in design
• Best practice exemplars
  Surveying existing design to identify good examples
  Organising design competitions (students, professional designers, SMEs) to create new examples
  Disseminating good case studies to industry and relevant organisations and help them adopt a more inclusive approach

• Methods and tools
  Providing training to designers (through education or professional training programmes/workshops)
  Adapting established methods and tools to suit the Chinese context

• Policy, standards and guidelines
  Collaborating with Government and Non-governmental organizations (NGOs) to push the agenda
  Conducting design audits to identify problems and propose recommendations and solutions
  Establishing research labs and centres, not only to advance knowledge in the field but also aim to have impact on policy and standards.

In addition, it is important to raise the awareness of inclusive design at a society level. This may be achieved through:
• Educating the whole society about diversity and equality
• Working with media to change people’s perception of ageing and disability
• Convincing decision-makers to adopt inclusive design as a means for building a harmonious society.

Concluding remarks: an initiative

This paper outlines the context (ageing, disability, design, and research) of China and makes proposals to build a solid knowledge base for inclusive design. The author has taken an initiative in China: the Inclusive Design Research China has been established at the College of Design and Innovation of Tongji University. Its main objectives are to:
• Raise the awareness of inclusive design
• Facilitate wider uptake of inclusive design
• Advance the knowledge of inclusive design
• Develop effective teaching strategies for inclusive design

At the preliminary stage (2010-2011), Inclusive Design Research China focuses on the following activities:
• Introducing the concept of inclusive design to the public (through producing a short film on inclusive design and editing a special issue of ‘All Design’ magazine)
• Developing local case studies and user data, and organising inclusive design competitions among design students and professional designers
• Conducting a range of pilot studies with different organisations and disciplines to identify and prioritise potential research areas
• Developing a module on inclusive design for university students

These activities will help build the knowledge base for inclusive design – a strategy for social innovation to benefit the world’s largest population.

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References


