

Designing a Domestic Heating Product for Older People Within the Concept of 'Contained Living Spaces'

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Designing Independence for an Ageing Population

The world's population is ageing rapidly; by 2050 it is projected that two billion older people will be alive.¹ By this time, it is predicted that two in five persons will be aged sixty years or over in some European countries.² The importance of maintaining independence as we age was first highlighted following the Vienna Plan of 1982. In this, the United Nations cite independence as one of the five principles for older persons.³ The Irish population will have some unique challenges as it ages. It is forecasted that between 2010 and 2060, Ireland will have the largest overall population growth in Europe, equating to an increase of 46%.⁴ With this growth, there will be a projected rise from 11% to 29% of the older adult population by the year 2041.⁵ Maintaining independence by ageing at home or 'ageing in place' is not only a goal but a high preference for the older Irish population. Hannah McGee *et al.* have reported that up to 89% of Irish older adults would prefer to live at home rather than live in institutional care.⁶ The

¹ See United Nations. *World Population Ageing 2013*. (New York: Department of Economic and Social Affairs. Population Division, 2013).

² See United Nations. *World Population Ageing: 1950-2050*. (New York: United Nations Department of Economic and Social Affairs. Population Division, 2001).

³ See United Nations. *Vienna International Plan of Action on Ageing*. (New York: United Nations, 1983).

⁴ See European Commission. *Europe in Figures. Eurostat Yearbook 2011*. (Luxembourg: Publications Office of the European Union, 2011).

⁵ See Paul McGill. *Illustrating Ageing in Ireland North and South: Key Facts and Figures*. (Belfast: Centre for Ageing Research and Development in Ireland, 2010).

⁶ See Hannah McGee, Ann O'Hanlon, Maja Barker, Anne Hickey, Rebecca Garavan, Ronán Conroy, Richard Layte, Emer Shelley, Frances Horgan, Vivienne Crawford, Robert Stout, and Desmond O'Neill. *"One Island – Two Systems: A comparison of health status and health and social service use by community-dwelling older people in the Republic of*

environment in which we age and live our daily lives has an immense bearing on our health and independence.

The products, and more precisely domestic products, that we use in our living environment greatly assist us in maintaining positive wellbeing. They provide for essential living conditions and therefore health and independence. Independence provided by these products promotes positive ageing in place and a higher quality of living by assisting in everyday necessary tasks. Designers can do much to assist daily requirements, and by doing so, increase the independence of an ageing population. A study by Fisk *et al.* identified this, stating that more than 50% of problems older adults have with daily living could be addressed through design efforts.⁷

In the future, health care will truly begin at home. Firstly, there will be a growing need to maintain a healthy independent ageing population for social and economic purposes. Secondly, there will be a growing reliance on domestic products to help maintain this health and independence. Domestic products that address fundamental health needs, enhance wellbeing and improve qualities of life are of most importance. Products that provide better every-day basic health care conditions require immediate attention. Central to this are products that provide for adequate environmental conditions.

Indoor Household Temperatures

Our physical environment and the conditions that we live in greatly influence our health and quality of life. There is increasing evidence that built environmental conditions have serious effects on physical, mental, and social health. For instance, poor environmental conditions are known to be influential in a range of illnesses, from cardiovascular diseases, obesity, and chronic depression.⁸ Indoor and household temperatures have major effects on health and more importantly, mortality. A report by the World Health Organisation states that “Extreme high and low temperatures [are] an underestimated cause of ill health and premature death in many countries”

Ireland and Northern Ireland. (Dublin: Royal College of Surgeons in Ireland. Healthy Ageing Research Programme – HARP, 2005).
https://www.publichealth.ie/files/file/One_Island_2_System.pdf

⁷ See Arthur D. Fisk, Wendy A. Rodgers, Neil Charness, Sara J. Czaja, and Joseph Sharit. *Designing for Older Adults: Principles and Creative Human Factors Approaches.* 2nd ed. (Florida: CRC Press, 2009).

⁸ See World Health Organisation. *Housing and health: Identifying priorities – Meeting Report.* (Bonn: Regional Office for Europe, European Centre for Environment and Health, 2003).

(WHO 2001: 12). Factors such as poor mobility and health issues can confine older people indoors for longer. Therefore, as we age, indoor temperatures have more serious implications for health and mortality. Temperature extremes, for example, from cold to hot indoor temperatures, are known to lead to more accidents and personal injuries in the home.⁹ On a more serious level, in the United Kingdom, indoor temperatures were shown to cause an additional 40,000 deaths in winter months in comparison to other months of the year.¹⁰ Furthermore, findings from this study show that colder indoor temperatures are the main cause of winter mortality, causing cardiovascular and respiratory disease with older persons at greatest risk. A further study by Wilkinson *et al.* (2004) examining this rise in mortality concluded that an upward adjustment in indoor temperatures lowers levels of vulnerability and mortality.¹¹ It should be noted that winter deaths do not directly correlate with colder climates. Spain, Portugal and Ireland have the highest number of winter deaths in older people, with countries with colder climates, lowly ranked.¹²

Research conducted – fieldwork

To enquire into domestic heating product requirements of older people, immersive and contextual field research was conducted. The research involved Design Ethnographic fieldwork over 12-months within the homes of forty older-adult participants. Participants were selected from various socio-economic groups across eight counties in the Republic of Ireland. Data was collected through Interview, Observation and Participation. Following fieldwork, data was coded, visualised and analysed through a

⁹ See World Health Organisation. *Housing and Health in Europe*. (Copenhagen: WHO Regional Office for Europe, 2001).

¹⁰ See Paul Wilkinson, Megan Landon, Ben Armstrong, Simon Stevenson, Sam Pattenden, Martin McKee, and Tony Fletcher. *Cold comfort-The social and environmental determinants of excess winter deaths in England 1986-1996*. (Bristol: The Policy Press and the Joseph Rowntree Foundation, 2001).

¹¹ Paul Wilkinson, Sam Pattenden, Ben Armstrong, Astrid Fletcher, R. Sari Kovats, Punam Mangtani, and Anthony J. McMichael. "Vulnerability to winter mortality in elderly people in Britain: population-based study." *British Medical Journal*. 329. 7467, 2004. 647. See also: Christine Liddell, and Chris Morris. "Fuel Poverty and Human Health: A Review of Recent Evidence." *Energy Policy*. 38. 6, 2010. 2987-2997; and Helen McAvoy. *All-Ireland Policy Paper on Fuel Poverty and Health*. (Dublin: Institute of Public Health in Ireland, 2007).

¹² Jonathan D. Healy. "Excess winter mortality in Europe: a cross country analysis identifying key risk factors." *Journal of Epidemiology & Community Health*. 57. 10th November 2003. 784-789.

grounded theory approach. The findings of this research supported the view that future designed products should provide for the basic health needs essential to older adults within the domestic environment. The findings further reported that other factors should be equally considered if independence and age in place are to be addressed. Demonstrated was that heating products encompass a complex mix of wellbeing factors such as emotional and social needs. Furthermore, it was also established that future designed heating products should consider financial cost factors, product safety, ergonomic and usability needs of older people.

The Concept of ‘Contained Living Spaces’

Findings from the research strongly indicated that mobile heating products required immediate design attention. To illustrate this, a specific pattern of usage was recorded from many older adult participants. It was deduced that limited mobility in older people leads to smaller and more confined living environments. Observed were older people creating modular stations around themselves for quick access to personal and important items. For the purposes of description, the researcher noted these as ‘contained living spaces.’ Figure 1. illustrates an example of this concept.



Fig. 1: An example of a ‘contained living space’ constructed as a result of mobility issues and located near a heating source

These spaces or ‘stations’ were typically constructed for functional use. Commonly, these were located around the older person and at close proximity to them. These were usually a construct of moveable furniture, for example, tables and desks. These ‘contained living spaces’ were commonly located beside heat sources such as radiators and portable heat sources, for example, small electric heaters. Within this concept, it was noted that there was a requirement to allow for living spaces within the home to be made more accessible through heating. Allowing the older adult more mobility and independence rather than remaining within contained spaces. This prompted the need for specific portable and space heating solutions for older people, supporting research by Hue-Chi Liao and Tsai Feng Chang who identified that the specific requirement for space-heating increases as we age.¹³

Further design requirements were also noted when researching within the concept of contained living spaces. Throughout the research, there were prominent links in heating product usability and pain relief associated with arthritis and poor circulation (Fig. 2). Placing affected areas such as fingers, hands or feet on a warm surface – or a cool surface when the product was turned off – was shown to offer gradual relief of pain. As the portability of mobile electric heaters allowed more agility and provided flexibility of use, commonly these were a central means of comfort from physical pain when doing other activities such as viewing television, during pastimes and relaxing in the evenings.

¹³ See Hue-Chi Liao, and Tsai Feng Chang. “Space-Heating and Water-Heating Energy Demands of the Aged in the US.” *Energy Economics*. 24. 3, 2002. 267-284.



Fig. 2: Portable pain relief: A research participant utilises his portable electric heater to alleviate arthritis pain in his sitting room.

Design Process – Ideation Sessions

One of the key purposes of sketching in the ideation phase of design is to provide a catalyst to stimulate new and different interpretations. Hence, sketching is fundamental to the cognitive process of design. (Buxton 2007: 115)

Design ideation sessions were completed to explore ideas, and with a view to creating heating product solutions within the area of contained living spaces. To facilitate these sessions, a list of design requirements was created from the ethnographic field study. During these sessions, ideas were sketched and explored comprehensively using the media of A3 layout paper and felt-tip ink pen. Ideas were sketched until exhausted and then progressed by sketching iteratively on to another idea. As a result of this, a large quantity of quick succession sketches was created to act on the momentum of ideas as they flowed.

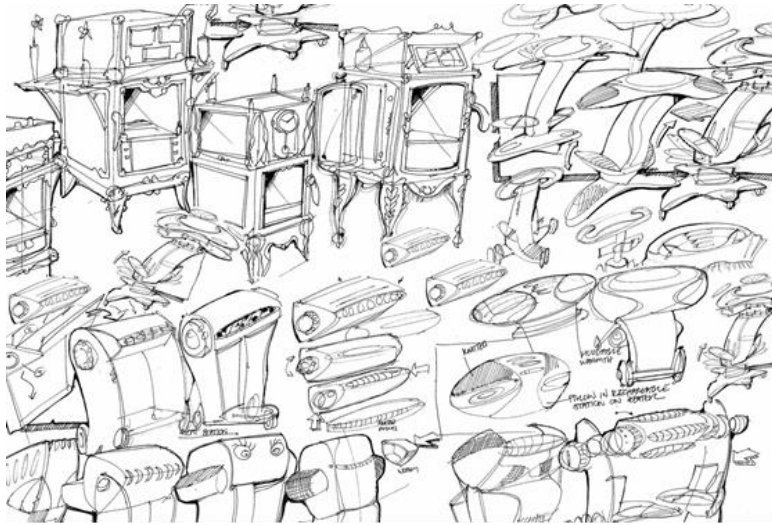


Fig. 3: A montage of images showing a series of ideas in evolution from the ideation sketchbook

Throughout the process, one sketch was allowed to serve as feedback for the next. Ideas were allowed to progress in a free manner at times, and on other occasions were rigidly and strictly bounded by the requirements. These sketches varied from conservative and practical ideas to chaotic and unconventional ideas. The quality of these sketches varied in detail to allow interpretation of meaning when reviewed at a later date. To document the process of sketch ideation, a sketch book was compiled. The final sketchbook comprised of approximately five-hundred iterative and exploratory sketches. An extract of these sketches is featured in Fig. 3.

Creating Concepts from Ideation

Completing the process of conceptualisation involved the convergence and synthesis of sketches. In traditional design processes, convergence involves synthesising conceptualised material – that is, ideas and sketches – into smaller groupings of concepts. Firstly, the entire ideation sketchbook was fully reviewed using the aforementioned design requirement list created from the ethnographic field study. As a means to reduce the quantity of concepts, any sketch concept not relevant to this list was filtered out and not brought forward for progression. To converge further, the ideation sketchbook was then reviewed for a second time, on this occasion to ascertain broad concept groupings that best represented all remaining

requirements. In this review, an external reviewer accompanied the researcher. During the review, it was decided that the sketchbook should be physically categorised into three overarching concept groups for progression. The next step in the process of convergence was to narrow the three concepts into one concept to progress with. In the process of selecting concepts for design progression, Karl Ulrich and Steven Eppinger recommend using a concept screening matrix. Based on the “Pugh concept selection process” (Ulrich, and Eppinger 2000: 144), a concept screening matrix allowed for rating and ranking of concepts for progression.

Design Conclusions – The ‘Hot Desk’ Concept

The concept ranked highest for progression in the concept screening matrix was a concept entitled ‘Hot Desk’ (Figs. 4a and 4b) In its most basic form this product concept is a portable desk or modular station with a small heating device as a built-in feature. Within the concept of contained living spaces, the ‘Hot Desk’ could act as a solution for a portable heating product for older users. Central to this concept are its flexibility of use and portability. The Hot Desk would have a ‘ubiquitous’ aesthetic, allowing it to blend into conventional living room situations and not stigmatise the older adult in any way. It has four caster wheels for portability and as it is based on a traditional desk format, it allows for storage and resting of personal items. It has a heating element built into the desk to warm user’s hands, arms, and legs as they sit at the desk.

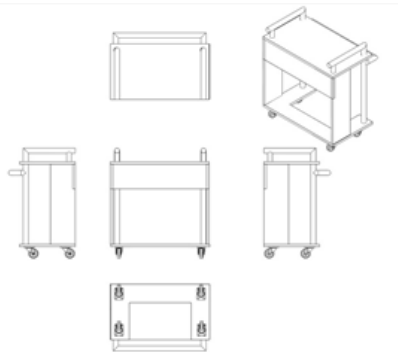


Fig. 4a: An early technical drawing

This concept also has the potential to further fulfil a role for older people with limited mobility. It has a long mobility support handle and,

therefore, the product could at times be used as a mobility walker. The concept can be recharged, therefore, reducing the use of electronic cables which can be instrumental in causing trips and falls in the home. A prototype of the table was constructed and will now be used as a usability test rig. It will undergo field testing within the homes of older people to analyse appropriateness of use.



Fig. 4b: A prototype, for use in field usability testing

Summary and further development

As the world's population ages, designers have an opportunity to create domestic products that provide for ageing in place. Domestic heating products that allow for the regulation of indoor temperatures are fundamental to this. This study identified that for older people, heating products encompass a complex and diverse mix of wellbeing needs and usability/ergonomic factors. Within this, the concept of 'Contained Living Spaces' was observed as an area that required immediate design intervention. Sketch ideation and prototyping were conducted to iteratively develop suitable concepts. From this, the "Hot Desk" concept, a mobile heater incorporated into a modular table was selected for development. A prototype has been created for further improvement, this prototype will undergo contextual field testing to analyse appropriateness of use. The findings of this study will be further iterated through prototyping, and will involve older people continually in the design process. The final product is intended to act as a solution to 'contained living spaces' opening spaces within the home, allowing more mobility and independence.

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