

Shared Usability - a support mechanism to product and service system design for older adults

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Abstract

Globally the Older Adult population is increasing; people are living longer, often with physical or functional limitations whilst remaining in their own home. This indicates a requirement of responsibility by Associated Stakeholders to support ageing in place. The concept of shared usability proposes that Older Adults can maintain independence, choice and empowerment, with mutual agreed levels of support from Associated Stakeholders when using products or services. Research was conducted as a means to identify and explore shared usability in the context of a user centred design process. Qualitative research methods with an ethnographic approach were conducted over a nine-month period. The fieldwork involved observing and understanding everyday life for the Older Adult in their own home, with specific enquiry and task observation of eight areas. Design methodologies of ideation, sketching and iterative sketch models were applied in order to select one specific area for design conceptualisation. Further to this, brainstorming sessions involving participants using storyboard and feedback were used to evaluate proposed concepts. The product concept outcome highlights how product and service systems can be developed with inclusion of shared usability. The fieldwork offers recorded and detailed enquiry of the experience of ageing. Finally, a definition of shared usability is proposed as a tangible consideration during the process of design that facilitates the user being supported by a network of Associated Stakeholders.

Introduction

People are not only living longer, but often living longer and independent with some functional limitation. The growing ageing population directs a need for designers to engage with research specific to Older Adults & ageing. The intention of design research must be to improve and endorse the choice and autonomy older adults deserve when using products or services.

This paper discusses in three parts, the approach and delivery of conceptual outcome using shared usability as a mechanism that offers mutually agreed levels of usability between a user and associated stakeholders when implemented as part of a user centred design method.

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Part One – Literature review: The initial enquiry was to understand and record quantitative data that displayed areas of relevance to understanding the context of research. This data was critical to identifying and understanding the scope and limitations of the research. There were numerous supportive documents published by Global and research agents researched in order to develop the areas of enquiry for fieldwork. (i.e. United Nations, European Commission, International Organisation for Standardisation, Centre for Ageing Research and Development in Ireland) It reviews the ethical considerations and concludes by sharing the strategy to prepare for fieldwork and the recruitment of Older Adult participants. Concluding with the eight areas of enquiry selected for fieldwork

Part Two – Fieldwork Methodologies: Part two discusses the methodologies that were used, and highlights design ethnography as the research method selected. It details the fieldwork sessions undertaken during life-logging and task observation sessions.

Part Three – Research outcomes: The conceptual phases of design to product and service system concept outcomes of the research are discussed. As a result, the concept of the ‘SmartShare System’ was created. This concept promotes and highlights how a User (the Older Adult) will select the levels of engagement they have in managing heating and fuel efficiency in their home. The paper concludes by displaying an infographic that highlights the journey of this research through to the research outcomes.

Part One – Literature review

This research is a progression of findings from previous design research titled: “Designer as Ethnographer: A Study of Domestic Cooking and Heating Product Design for Older Adults” (White, PJ. 2012). White highlighted the potential for shared usability’ as a supportive method of intervention between Older Adults and Associated Stakeholders when using products or services.

The broad intent of this research was to identify unmet product and service needs within the day to day lives of Irish Older Adult participants and integrate methods to a user centred design process. There was a need to define the research methods to be conducted, for example, what areas of day to day life of Older Adults that would be researched within their home environment. Literature reviewing assisted understanding of the limitations people have in living at home in later life. Ageing can present a decline in sensory function, mobility, balance and memory and therefore impact on our ability to remain independent, (Farage, Miller et al. 2012).

The Madrid plan of action on ageing states the requirement to support the desire an Older Adult has to age in a home of their selection and type (United Nations, 2002). These factors, combined with reduced fertility and birth rates determined the requirement to explore the viability of shared usability’ for Older Adults. The International Classification of Functioning, Disability, and Health (ICF – World Health Organisation; 2001) offered a frame of reference to understand this (see Figure 1). This classification gauges’ individual’s health or disability in context to

their environment or ability. It offered support and guidance to the research by stating definitions and limitations to activities and experience a person may have throughout life. The classification is outlined in the 5 points as follows:

1. Activity: the execution of a task or action by an individual.
2. Participation: involvement in a life situation.
3. Activity limitations are difficulties an individual may have in executing activities.
4. Participation restrictions are problems that an individual may experience in life.
5. Environmental and Personal factors make up the physical, social and attitudinal aspects of the user. Defining the areas to observe the day to day life for Older Adults was identified further by the Information matrix published by World Health Organisation.

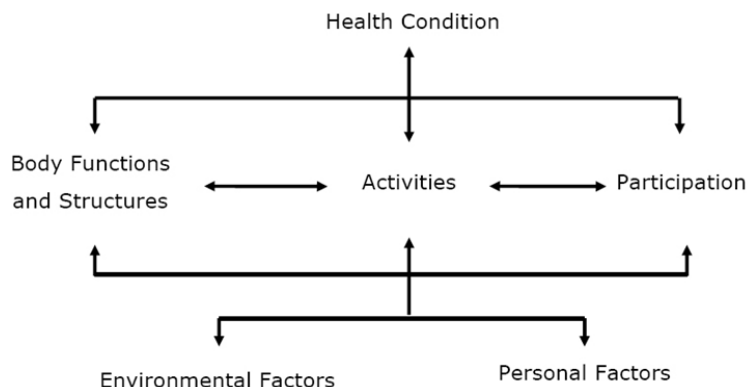


Figure 1. Framework for ICF - WHO, 2001.

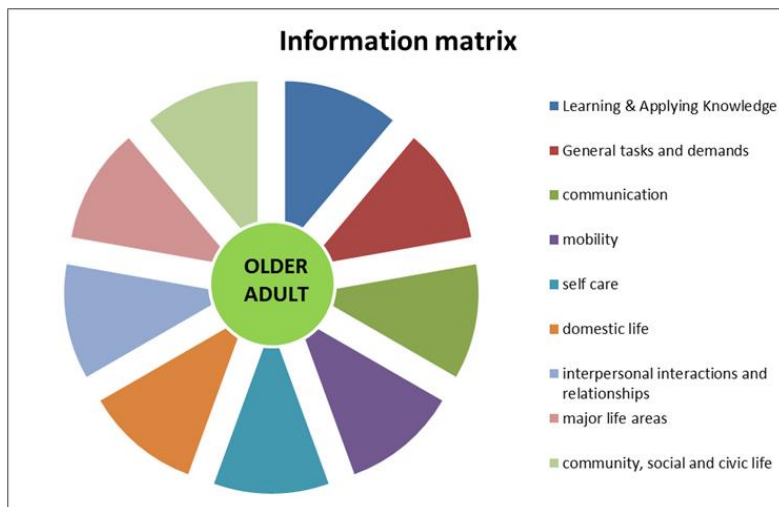


Figure 2. Information matrix as listed per ICF 2001 - WHO as interpreted visually by Author.

In addition to the International Classification of Functioning, Disability, and Health (WHO; 2001), the Information matrix (Figure 2) offered classification guidelines to consider the human factors need for this design research. It highlighted the potential enquiry areas associated with Activities and Participation, and how these can relate to contextual needs of the environment and person. This would assist the developing of the enquiry template that would be used as a memo tool during the fieldwork.

Finally, Parker and Thorslund's study of disabled elderly people in Sweden further assisted with defining areas of enquiry. It discussed the use of technical aids as a facilitator to ageing independently (Parker & Thorslund., 1991). Figure 3 was designed by the researcher as a means of interpreting the requirement needs of fieldwork for this project and was adapted as per the areas of enquiry conducted by Parker and Thorslund.

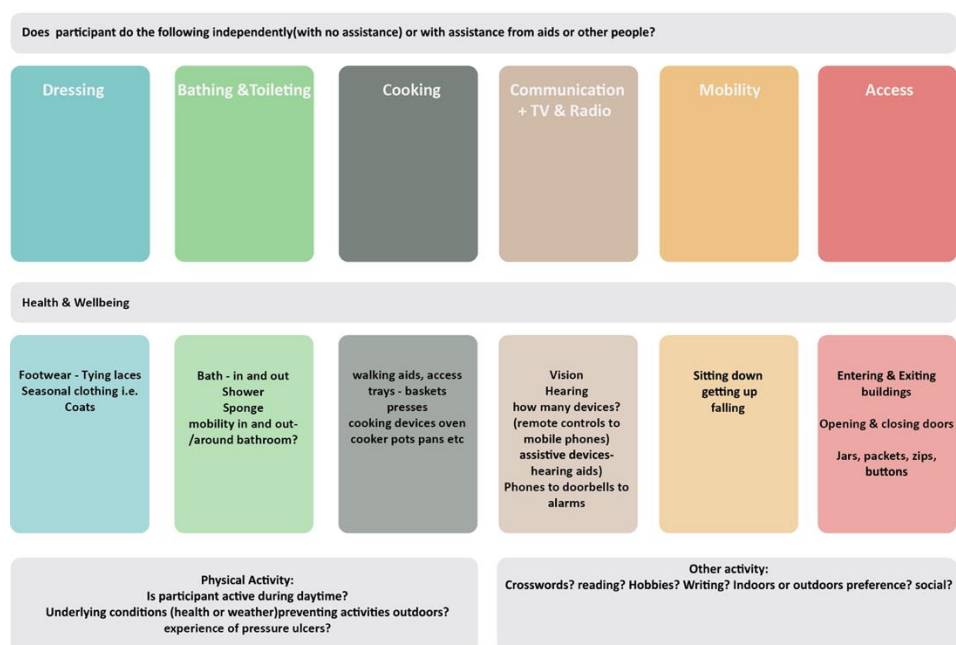


Figure 3. Adapted from 'The use of technical aids among community based elderly' Parker, M.G; Thorslund, M; 1991.

The first six areas to explore in fieldwork were seen as direct activity, and necessary to function independently:

- Dressing
- Bathing & Toileting
- Cooking
- Communication, TV &radio
- Mobility
- Access

The remaining two areas were considered more selective to choices and priorities people place in their day to day activities:

- Interests & Activities
- Physical Functions/Limitations

The opportunity to develop and define the concept of shared usability now had a format and frame of enquiry. A format that would allow the Older Adult participants narrate their day to day life and experience. This format would allow capturing 'uncertainty' and allowing the 'user' to be involved in the process of research and design (Papanek; 1985, Demirbilek 1999, Button 2000, ISO; 2002, Norman 2002, DreyfussH; 2012 Ed.)

The literature review provided the basis to plan the fieldwork and address ethical considerations to recruiting and engaging with participants. Together with important statistical evidence to progress with this research the literature reviewing clarified the following areas:

- Identified and defined the Older Adult as purpose User to be studied for this research.
- Acknowledged areas that can be problematic for Older Adults (i.e. fuel poverty, pressure ulcers)
- Identified a qualitative method of enquiry using ethnographic methods as a means to understand day to day life for Older Adults.
- Defined a need to seek ethical approval within Institute of Technology, Carlow for the parameters of fieldwork to be conducted.
- Highlighted a need to conduct Pilot Studies as the precursor to the main body of fieldwork.
- Assisted deep understanding to specific design philosophies that explore usability and consider more than one user (i.e. Universal Design, Inclusive Design, Transgenerational Design)
- Shared insight to various areas of understanding people and the psychology of experience and behaviour when using products or services.

The research explored three areas that were identified and stated both in the research title and learning outcomes from the Literature review. In addition, the three areas of focus created research questions:

- The Older Adult
Research Questions:
What is an 'Older Adult'?
How can day to day activities and experiences be learned and understood?
- Shared Usability
Research Questions:
What is 'Shared Usability'?
How can 'Shared Usability' be developed?

- Product Design
Research Questions:
What is Product design?
Who are 'users?'
How can Shared Usability become part of Design process?

The research hypothesis was developed as an outcome of the literature review and prior to the fieldwork.

'It is possible to empower Older Adults through Shared Usability by mutually agreed intervention with other stakeholders when using products or services.'

The researcher pursued enquiry with a tacit knowledge that was enhanced further by the narrative shared by the participants during the Pilot studies and fieldwork. The research developed at a pace that often required reflective periods. This was to assess and consider the previous stages of research while anticipating the potential development for future stages and outcomes. The objective of this consideration and reflection supported the researcher during sessions that required strategy and planning.

Design thinking is an intrinsic feature to design research. It offered the researcher an opportunity to explore and analyse the project or situation and deliver creative outcomes that are not detached segments but connected sequences to the 'whole' of the project (Brown, T. 2009). The research methodologies facilitated the iterative and non-linear nature of the design research as an exploratory process. The acceptance of this exploratory process was not to indicate a chaotic or disorganised approach; instead it displayed a creative approach undertaken by the researcher. This displayed the researcher's ability to share insight from observing actual experience and behaviour of people as a means to identify unmet needs.

Part Two – Fieldwork Methodologies

Fieldwork was conducted as a means to define unmet needs within eight areas ensuring a comprehensive record of Older Adult behaviour and experience. The fieldwork methods of observation, interview and task analysis within the day to day life for Older Adults revealed in-depth insight.

In addition, three Pilot studies were conducted offering new knowledge and insight into Associated Stakeholder involvement in Older Adult day to day activity.

Eighteen Older Adult participants and three associated stakeholders (Family member, Occupational therapist & healthcare manager) engaged with the researcher conducting fieldwork over a period of nine months.

The researchers own experience and building of knowledge throughout the fieldwork would support the development of the research. Interaction between the participants and the researcher would provide beneficial insight that would develop empathy as an objective measure to research outcomes (Denzin, N.K., & Lincoln, Y.S. 2005).

Ethnography “*involves the researcher participating, overtly or covertly, in people’s daily lives for an extended period of time.*” (Atkinson, P., & Hammersley, M., 2007, p.3).

Qualitative methodologies with an ethnographic approach were applied to observe and develop understanding of Older Adult day to day experience and behaviour as a means to understand Older Adult behaviour in two contexts:

- Life-Logging
- Task Observations

Life-logging

Life-Logging was conceived by Steve Mann as a method to record daily activity. Life-logging was used in this research to support an ethnographic method that could passively record Older Adult behaviour within the natural setting of their home. There was a total of sixteen life logging sessions conducted as part of this enquiry.

Firstly, a template was created for the Life-logging sessions. This was used to memo and document all notes or sketches during the sessions. The format of the template was structured into eight areas of enquiry with an informal approach that relied on a series of ‘random words’ (Collins, H., 2010) listed with each area of enquiry. This supported a strategy to explore the eight areas with open-ended questions that encouraged rapport, trust and storytelling with participants.

Task Observations

Observation is “*...the fundamental base of all research*” as discussed by Angrosino (Denzin and Lincoln 2005. p.729)

Task observation sessions were arranged with eight participants. Each of the participants would conduct a physical task linked with one of the eight areas of enquiry. The eight task observations were conducted in an unstructured format and led by the participants. The researcher discussed the proposed task observation with each participant prior to the activity. This was to ensure the participant was in agreement and also to discuss any other considerations necessary to the task (i.e. weather permitting for task outdoors)

The Task Observation sessions were an extremely rich source of contextual enquiry. They recorded human factors and ergonomic considerations. The participants were observed manoeuvring steps, furniture and fittings in order to complete tasks. During these observation sessions the researcher used a non-directed approach with the participants with the intent of conducting sessions that did not interfere with the participant’s activity being observed. However, during sessions there were moments of direct interaction between the researcher and the participant. This direct interaction was seen as a positive development in the research because it supported the research hypotheses, whereby the Older Adult was inviting the researcher to engage or assist with the task, but on their terms. Shared usability was presenting itself to the researcher through the direction of the Older Adults.

The Older Adults naturally immersed themselves with the researcher within the focus of the task. Often the narrative from the participant would digress from the task being conducted to other subject matters important to them. This was beneficial to further understanding other aspects of day to day life. An example of this was when one participant shared the story of a house extension he and his wife decided to add to their home a number of years ago. At the time of construction, they decided to incorporate ramps as part of the outside access paths into the home. This insight demonstrated forward thinking of this participant and his wife. The rationale being that should they require mobility devices in the future, the familiarity of the ramps will be less intrusive as they adjust to a new means of mobility and independence.

At this point of the research validation of fieldwork findings was required. Furthermore, it had to be analysed with consideration to the research hypothesis:

'It is possible to empower Older Adults through 'Shared Usability' by mutually agreed intervention with other stakeholders when using Products or services.'

Krippendorff & Butter refer to a 'network of stakeholders' as one of the four conceptual pillars that support Human Centred Design. (2008) Krippendorff & Butter discuss how, in addition to the user there are various stakeholders that become the 'network of stakeholders' relevant to the design outcome.

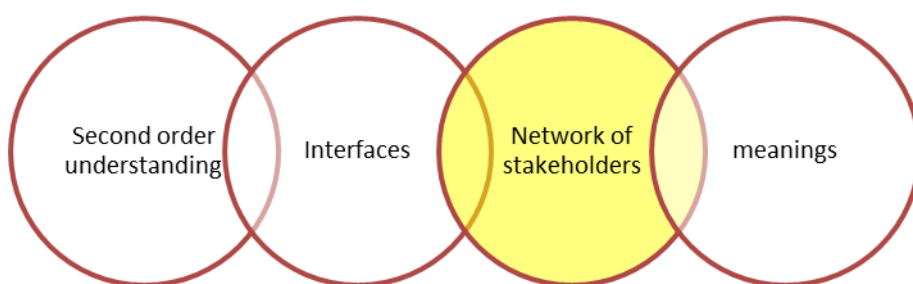


Figure 4. Four Pillars that support Human Centred Design as interpreted from Krippendorff & Butter 2008.

The User is described by Krippendorff & Butter as almost a figment built out of a "rhetorically convenient illusion that designers offer their clients in justifications of their design" (2008, p.358). There is a hierarchy of priority placed around the other considered stakeholders from clients who represent the business, financiers, engineers, market researchers, merchants, governmental agencies, buyers (not the

user), repairpersons, recyclers, ecological activists, and others who will “*variously experience a design and collectively affect its fate.*” (2008, p.358)

“Human-centred designers must acknowledge the critical role of stakeholders – supporters and opponents – welcome their active roles in bringing a design to fruition, and see themselves not as masterminding the process, but as active participants in such networks as well.”

- (Krippendorff & Butter, 2008, p.358)

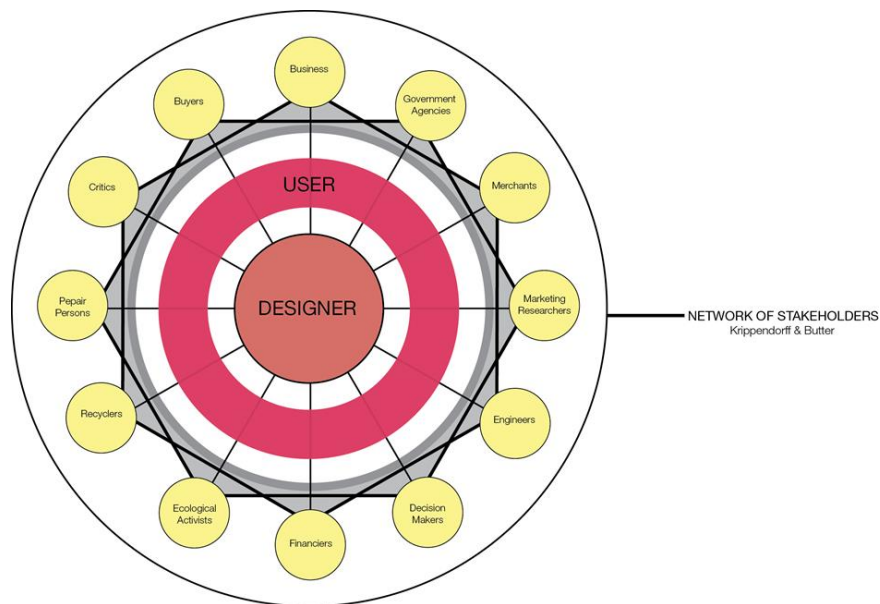


Figure 5. Interpretation of the network of stakeholders as per Krippendorff & Butter, 2008.

Krippendorff & Butter’s *network of stakeholders* expresses the responsibility of the designer to consider more than the user in the process of design, but from the perspective of the stakeholders involved in the development and delivery of concept to product development for the user. This research evolves the network of stakeholders to one that provides a support framework for the user through the network of *Associated Stakeholders* for shared usability when using products or services and is displayed in figure 6.

The researcher analysed the depth of knowledge gathered from the life-logging and task observation sessions as a means to underpin and define data. This data was then coded and indexed resulting in conceptual outcomes.

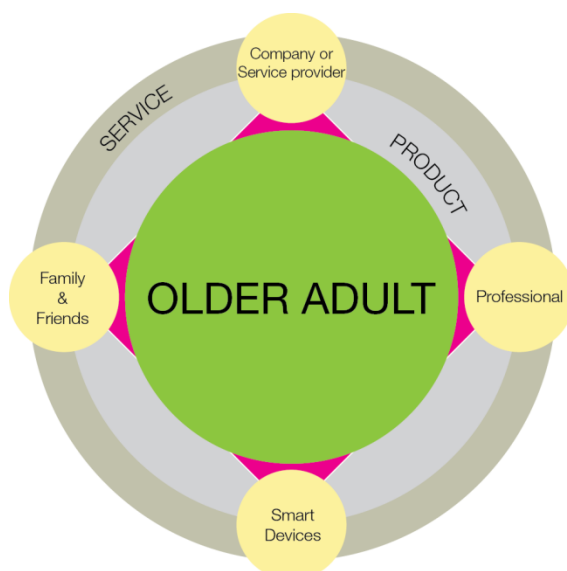


Figure 6. Network of Associated Stakeholders -Shared Usability – (Authors own).

Using a thematic coding approach (- Robson, C; 2011 Ed.) the data collected was collated and placed into themes as per the eight areas of enquiry. After which each theme were assigned labels. The labels were created and directed by the participant's responses and narrative during the life logging and task observation sessions.

Part Three - Research outcomes

The development of the concept of shared usability as a valid mechanism to the design process is evident by the body of research undertaken; in addition it has supported new knowledge outcomes:

The three new knowledge outcomes are as follows:

1. Fieldwork detailed enquiry into Older Adults day to day life experience
2. A definition of Shared Usability.
3. Product Concepts that display Shared Usability benefits to user experience.

Fieldwork detailed enquiry into Older Adults day to day life experience

The ethnographic approach to observing and understanding older adult participants in natural settings provided a deep source of insight and data in eight areas of daily life. The outcomes of fieldwork assisted in identifying and understanding potential product areas that could support a tangible understanding of shared usability.

A definition of shared usability

White described shared usability as a concept for independence (White, P.J., 2012). The purpose of this research was to enquire further into shared usability and to offer design examples from this enquiry. This was achieved by conducting fieldwork with Older Adult participants and other stakeholder's.

The research conducted, highlighted the potential benefits of shared usability in the design of products and services for Older Adults. This research also clearly highlighted the benefits of the engagement of User with Associated Stakeholders in product or services use. The User and Associated Stakeholder network have also been defined in this research offering understanding of the potential relationships that can support shared usability.

The definition of shared usability created from this research is as follows:

Mutual agreement between the User and Associated Stakeholders on the level of management or interaction required with a product or service as an objective to achieve positive usability.

Product Concepts that display shared usability benefits to user experience.

The eight areas of enquiry pursued during fieldwork were comprehensively explored as a means to identify unmet needs in products and services for Older Adults. This offered the researcher many areas to pursue design conceptual development. The fieldwork data gathered was triangulated determining the area of 'Access' as the most appropriate area to progress product development conceptualise within. The conceptual stage involved further feedback sessions informally between the researcher, Older Adults and Associated Stakeholders as a means to determine concept and product outcome.

During the fieldwork, a number of the participants had discussed problems regarding their home heating systems, some of them sharing how they often do not 'set' or automatically time their central heating using the timer- *particularly* mechanical timers.



Figure 7. Sample mechanical timer as per a participant's home.

A number of reasons were offered:

- Some participants preferred to know the cost implication, and preferred to turn it on and off manually as required
- ‘Pins’ that you raise or lower to set the time were too awkward to manage with fingers
- The location of the timer was poorly lit
- The small print of the numbers is difficult to see and accurately set the time
- Some participants felt it was more challenging to set the timer
- The location of the timer is usually under a press or cupboards and often located in the ‘hot press’.

SmartShare

Stakeholder map displaying agreed interventions between Older Adult and Associated Stakeholder when using Fuel level sensor and Smart wall unit

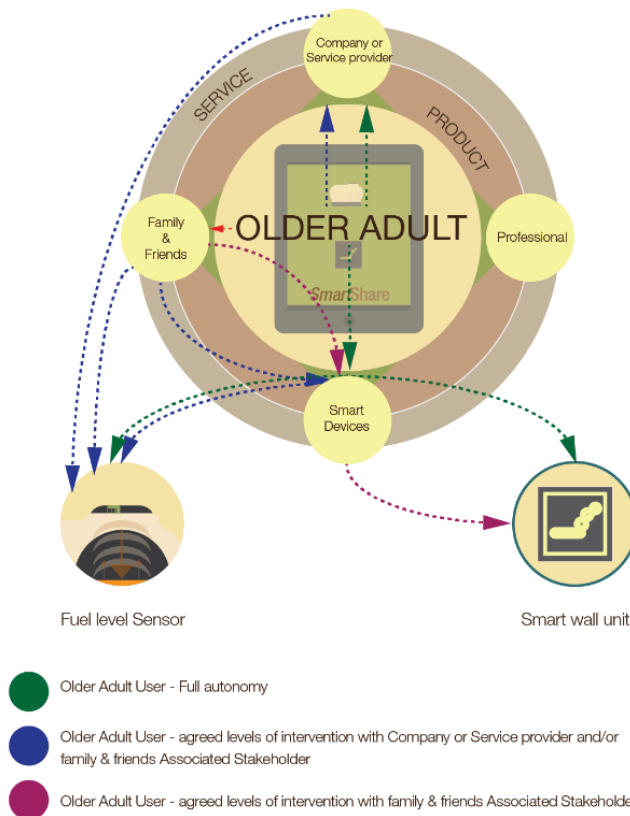


Figure 8. Stakeholder map displaying interventions between Older Adult and Associated Stakeholders.

The product outcome for this research, is one that involves the User (Older Adult) plus Associated Stakeholders (these can be family members, service providers, other companies). It is a retrofit device that is operated on a smart device, tablet or computer. It can be accessed by the user (Older Adult) or managed levels agreed between the Older Adult and Associated stakeholders. There is a second product need identified with the fuel supply and provision to the home, again the concept here is managed through a wireless network and agreed between the Older Adult and perhaps the utility company or service provider. The third area is the system of the 'App' supporting the product use and management. This can have further services or features added to as they get developed. This potentially could provide a home with services such as lighting, security, access in addition to the heating and fuel management concepts as an overall home service management system. shared usability stakeholder map is shown on Figure 8 in relation to usability access from user and associated stakeholders.

The conceptual product outcome of the *SmartShare* system supports the application of shared usability to the design process. This is achieved through iteration and collaboration of the following:

- User Centred Design
- Principles of Universal Design
- Design for all approach

User Centred Design considers the needs of a user when applied to the process of design. It requires defining unmet needs as identified by the user. The designer's responsibility is to deliver a product or service that is intended to fulfil these needs. However, the limitations of User Centred Design can be restrictive when Shared Usability is applied because of the requirement to consider the network of Associated Stakeholders to support the autonomy of the user – the Older Adult.

The principles of Universal Design were beneficial to the consideration of more than one user as a means to a design outcome; it supports also the consideration of human abilities and function when considering product or service system development. This was beneficial particularly to the impact of limiting function and mobility associated with ageing. However, where this faltered was the need to expand and Associated Stakeholders as supporters to the autonomy and independence of the Older Adult using products or services.

"Design for all relies on the involvement of potential users, where this means not only the end users, but all those involved in the design, development, production and marketing processes." (Krauss 2011, p. 13.2).

The following series of images (Figures 9, 10 and 11) display iteration and development to the relationship of the Design philosophies discussed, and implemented during the conceptual phases as a means to promote the value of *shared usability design*.

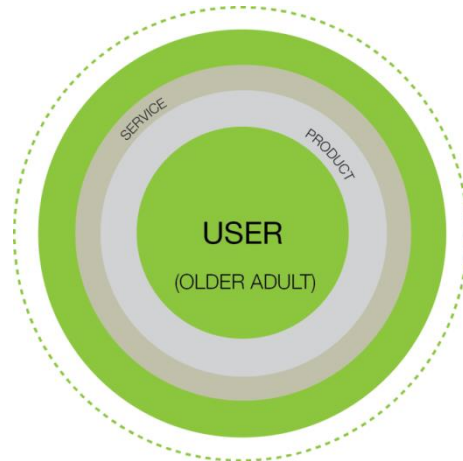


Figure 9. User Centred Design.

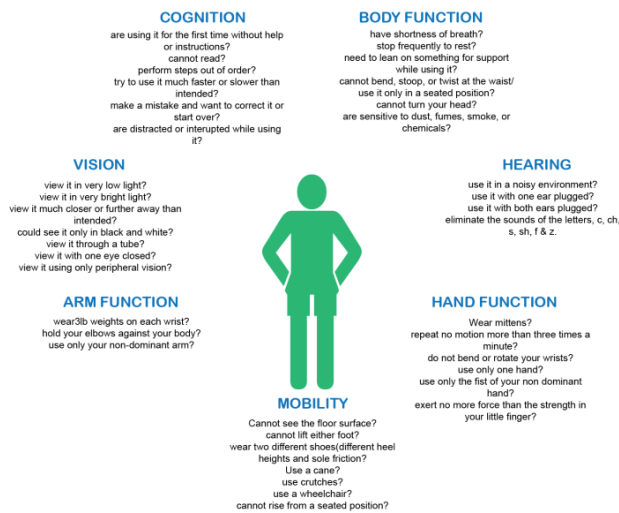


Figure 10. Spectrum of Human Abilities as per Universal Design file.

Conclusions

This research revealed that shared usability was previously an undefined existing activity that Older Adults and Associated Stakeholders engaged in. The research undertaken offers a definition of shared usability; which supports the requirements capture to consider more than one user engaging in the use of products or services. This research focussed on the Older Adult as the ‘User’ however the promotion of shared usability could offer enabling and empowerment to all users.

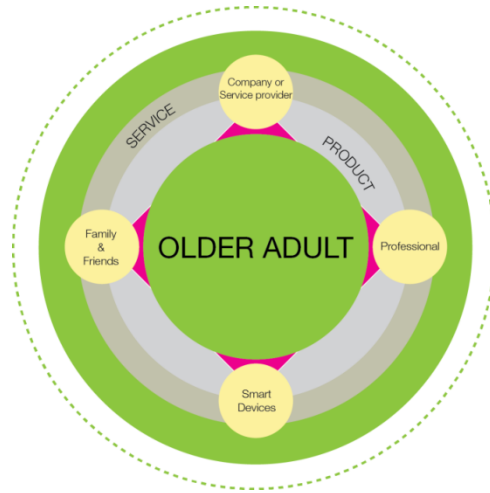


Figure 11. Shared Usability Design.

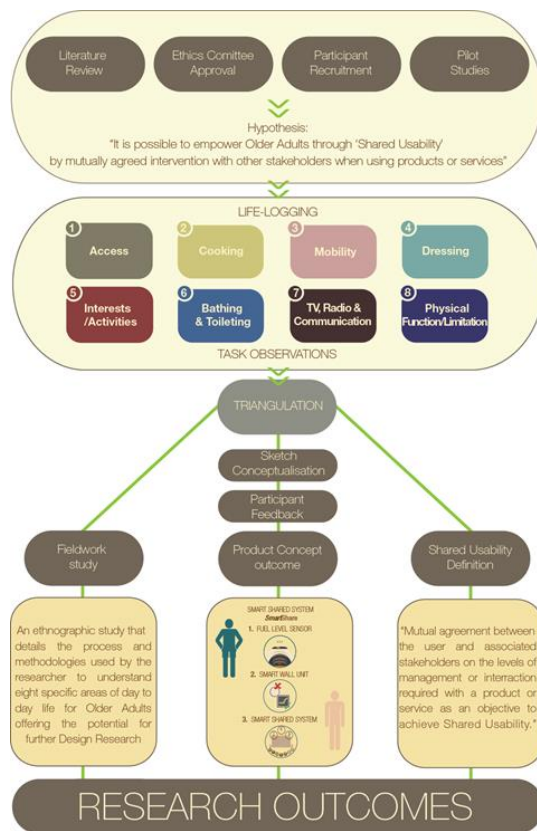


Figure 2 'story' and overview of this research

Future research could explore areas such as Older Adults and dementia, being supported by Associated Stakeholders as a means to prolong independence. Another example that considers shared usability and 'Users' other than Older Adults could be the area of play and recreation for children that would allow the child explore and be curious, whilst also being supported by the Associated stakeholders in their lives – Parents, Guardians, Educators etc. This could be an area that collectively could support the area of healthy eating and obesity or outdoor activities as examples. As a record of the work conducted and completed during this research, Figure 12 highlights the 'story' and overview of this research. It begins with the assessment of what was required in order to develop the hypothesis, and fieldwork strategy. The Life-logging sessions and task observations culminated to a stage of triangulating the gathered data and knowledge as a means to deliver new knowledge outcomes that conclude with product, fieldwork and shared usability outcomes. Shared usability was defined as an outcome to the research. This became a mechanism to support the process of design. The definition proposes that shared usability facilitates a 'User' and a network of Associated Stakeholders to manage and agree levels of interaction and usability when using products or services. Furthermore, it provides autonomy to the User enabling them to remain empowered as a result of initiating levels of usability with the Associated Stakeholders.

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