# Bridging the Age-based Digital Divide through Inclusive Design

*An Action research on the Adoption of Inclusive Design in Small e-Government Context*

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## Published Papers from the Thesis

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## Abstract

This research looks at using Inclusive Design as mean to bridge the age-based digital divide, by conducting Action research in a Local Council in the UK. Research on the digital divide looks at the inequality in technology access between different demographical characteristics. While this is very useful to highlight access inequality, it fails to address the steps required to bridge the gap. Some research even suggested that the digital divide is bridged and that research in this field is irrelevant. This is due to the narrow focus of some researchers about the digital divide. The focus should be not on whether older people possess Information and Communications Technology (ICT) products; it should be on how they use their products and what we can do to improve the person-technology fit. On the other hand, inclusive design has been a main driver to ensure that buildings and products do not prohibit people with disabilities from utilising the building or product. However, there is limited research about the extension of inclusive design practices in Information Systems (IS), particularly interface design and system design. Most of the current design guidelines and best practices do not provide a holistic view of the inclusive design process, thus leaving the designers on their own in terms of producing an easy interface for users, by just merely implementing the accessibility guidelines provided by the W3C to ensure inclusivity of the website or online service. Assuming that inclusivity is reached only by including screen readers and magnified modes to prospective users.

The aim of the research is to provide a clear picture to discover the main challenges to Inclusive Design as well as provide a holistic and thorough inclusive design metric that allows designers to ensure that their proposed website or online service is inclusive of users from different age groups and capabilities. This design methodology can

customisable according to the website or online service requirements, highlighting the important features to ensure inclusivity.

Using Action research as methodology to investigate and improve design practices in a local council. The research employed a mixture of research methods to understand and intervene in the creation of an inclusive e-service during the implementation of the Care Act 2014 in the Local Council. First, semi structured interviews were conducted to provide insights of the changes that the Care Act 2014 which brought upon social care and the way that social care services are being provided in the county. Then, observations were performed during the design sessions of the online services in the Local Council to see how the design process is being carried out to ensure that the website is inclusive of all prospective users. Finally, when the website is fully developed it was tested on various users with from different age groups using the inclusivity index developed as part of the evaluation phase of the design methodology. In addition, interviews with older adults were conducted to understand the issues that make them using ICT difficult so the needs of these users were documented to help in the design process later on.

The research indents to advance knowledge about inclusive design from practical and theoretical perspective. Practically, this research will help web designers and organisations looking to cater online services to as many people as possible and design methodology that fosters inclusivity. Moreover, this will help older adults to use online service by themselves, thus ensure that they can remain independent and exercise control over their needs from the government or otherwise. Theoretically, this research will help to shed the light on the digital divide and the ways to bridge this divide. By creating an inclusive design methodology that can fundamentally

address the causes of the divide rather than just simply patch existing design methodologies.

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To my aunt Laila (1951-2001)

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# Chapter 1: Introduction

## 1.1 Introduction

This chapter gives an overview of the research that constitutes this thesis. The chapter first provides a background of the topic of the research. After that, it highlights the research problem by highlighting the gaps in the literature and proposing research questions that shapes the scope of the research. Then it demonstrates the aims and objectives of the research. Finally, it outlines the structure and process of the thesis.

## 1.2 Research Background

Around the world and especially in industrialised countries people are living longer than their ancestors (Phang et al., 2006). While recognising that this is a bliss that modern medicine has provided, it sure comes with its own challenges. One of which is the increasing costs of social care due to the high demand. The UK tried to mitigate those high incurring costs of care with the introduction of the Care Act 2014 that ensures that no citizens should handle the costs of care on their own, and that they have control over choosing the appropriate care services using the advice services with the help of their corresponding local authority (National Archives, 2014).

While recognising that such legislation will spark even higher demand for social care services, county/city councils around the UK found it necessary to embrace new channels of communication to provide help and advice to their customers as well as provide other online services. Which led to the introduction of the online self-assessment and online information advice to reduce the workload on social care staff and to ensure that councils are able to reach a wide customer base. However, the online services provided by the councils

needed to be as inclusive of all users as possible including older adults who make up a large number of the beneficiaries of social care services. The customer journey through out the application process needed to be consistent and offer the same result regardless of the communication channel used. Local Councils have taken it upon themselves to create an application portal that mimics the interaction that of a natural conversation between social worker and prospective customer.

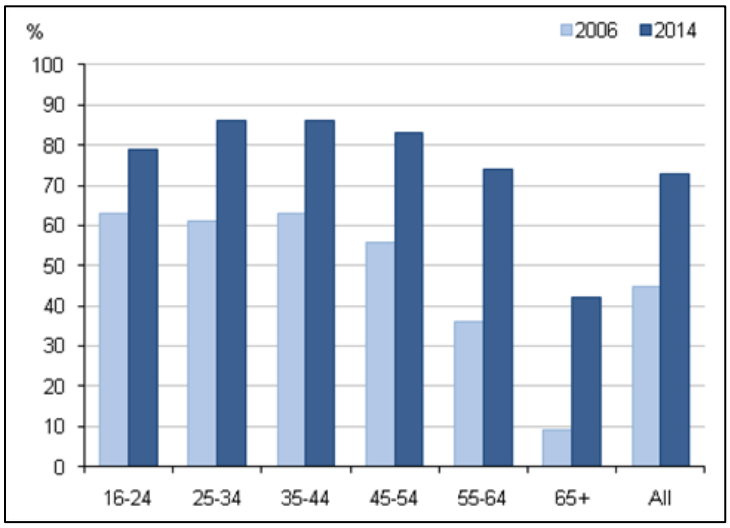



**Figure 1 – Internet usage based on age groups**

**Source: Office for National Statistics, 2014**

Inclusive Design approach seems to match the Local Council needs, but there was a lot to be done to ensure that the portal can provide a seamless interaction that would allow them to complete the transaction even if they had poor computer literacy or had any disability. The e-service should be able to allow people from all ages to have access to the social care services that the council will provide. Older adults have always been stereotyped as "Technophobic" and not considered during the design phases of technologies and e-services (Vroman et al., 2015). However, according to the Office of National Statistics (2014) the percentage of internet users who are 65 and above has jumped from 9% to 42% in 8 years as seen in

Figure 1 – Internet usage based on age groups. Acknowledging the fact that some prospective customers might delegate the task to their children and other trusted individuals, it is not feasible to develop a website exclusively for older adults, especially since the disparity of abilities within that age group is big which will make the development of the e-service more challenging. Thus, Inclusive Design has been chosen as a strategy to design such services that will have big customer base with different capabilities.

## 1.3 Research Problem

Given the research background described in the previous Section. The research problem lays in the inequality of access to technology that older adults endure due to the complexity of current technology, coupled with the rise of e-services provided by governments and business to allow people to interact with them in easy and convenient way (Hill et al., 2015; Rogers and Mitzner, 2016). All of this is all falls under the umbrella of improving the quality of life of people, however there is a gap in the person-technology fit among older adults. The mainstream technologies and e-services are catered to those with sufficient knowledge of technology (Chiu et al., 2016). This puts older adults at a disadvantage of missing the benefits that technology provides and further widen the digital divide.

Inclusive design on the other hand, promotes the inclusion of as many user groups as possible by lowering the requirement threshold to perform tasks online. Especially since designing websites and e-services exclusively for older adults does not translate into higher usage by older adults that justifies the investment (John Clarkson and Coleman, 2015). Even if cost was not the main concern, usage of these website and e-services might compromised due the psychological stigmatising effect of the label "for older adults" (Yusif

et al., 2016). Thus, handling the issue with enough sensitivity that enables older adults to use e-services without compromising any of the features of the e-service.

While inclusive design can offer a solution to improve, the technology-person fit to allow older adults to use e-services conveniently. There are limited attempts to provide and evaluation tool to test the inclusivity level of websites and e-services (Dong et al., 2015). Without the ability to evaluate how inclusive a website is, user interface designers will not be able ensure that their website will be able to respond to the needs of as many users possible. Of course, complete inclusion of all user groups is an impossible task, due to the variety of physical and mental capacities that people have (Langdon and Thimbleby, 2010). Inclusive design allows organisations to engage with as many customers by balancing the user requirements with the transaction requirement, and simplify the interaction by removing unnecessary features that distract the user (Keates et al., 2000). More importantly, it improves the e-service's ability to convey and gather information with minimal effort form the user (Matausch et al., 2012).

## 1.4 Research Gap & Questions

While searching previous work done in the field of the digital divide, it was noticed that there was a gap in the way researchers have addressed the issue. Specifically, on what can be done to bridge the digital divide. Some researchers came to the conclusion that the digital divide is now a thing of the past (Büchi et al., 2015; Vicente and López, 2011). What these researchers fail to address is that the digital divide is not just about possessing a technology at home, it is about utilising this technology in older adults' day-to-day activities (Hilbert, 2016). Also, a lot of studies claimed that older adults will

always resist technology because they are scared of it, thus they do not need to design products for them as they will delegate this technological task to their friends and family (Kiel, 2005; Sato, 2010).

However, recent studies have shown that while computer self-efficacy among older adults is lower than other age groups, they still acknowledge the benefits of technology and are very keen to learn how to effectively use them (Wild et al., 2012). Therefore, the technology available now has to be able to cater to the needs of older adults as well as younger and able-bodied users. While it is simple to say that technology should be inclusive of all users regardless of their abilities, it is easier said than done. Organisations face tremendous challenges while trying to develop inclusive e-services (Karkin and Janssen, 2014). Especially in the e-government context as the governmental entities are required to serve all people who wish to interact with government and unlike the commercial context, customers do not have alternatives if their needs are not met by the government entity. Many complicated and sometimes conflicting issues need to be addressed to create an inclusive e-service. This trade off needs to be done in a systematic way that ensures that the e-service is able to cater to as many users as possible while maintaining all the operational and technical requirements.

Moreover, there is limited research done on inclusive design and user interfaces. The majority of research done in inclusive design was in the field of product design and ergonomics, given that inclusive design is notion borrowed from the architecture and engineering field (John Clarkson and Coleman, 2015). There is great potential in applying the inclusive design principles in user interface design to allow people from with different capabilities to use e-services.

More importantly, there are limited measurement tools to indicate whether user interfaces are inclusive (Scott et al., 2015). Design guidelines are open for interpretation, thus there is no structured way to measure how inclusive the interface is. The ability to demonstrate how interfaces are able to cater to the needs of less abled people whether older adults or people with disabilities is key to ensure that the e-service will be usable by a large percentage of potential users. Thus, operations cost can be reduced and customers can engage with government or businesses conveniently. From the gaps mentioned above, this research proposed three research questions:

RQ1: What are the main challenges of adopting inclusive design practices in a small e-government context?

RQ2: How can inclusive design enable bridging the digital divide by improving person-technology fit?

The first question highlights the difficulties that governmental entities face when trying to embed inclusive design practices in their design process. The research used the implementation of social care forms in local council in the UK as an exemplar, to highlight the challenges endured during the implementation of this e-service. Especially since this e-service is going to be used by customers who are requesting social care service, thus the customer base for this e-service range from older adults to friends and family of the customer who are able-bodied. The e-service has to be easy to use for older adults and not let them feel inferior by included words like "accessible page" or "senior friendly".

The second research question looks at the ability of inclusive design to improve the person-technology fit. This question focuses on linking and improving the logic flow of computer transaction with

the normal transaction, thus reducing the cognitive requirement to understand and conduct the steps required for the transaction.

## 1.5 Research Process

Action research was chosen as the research design in this thesis. In this research design, the researcher is actively engaged with the research participants to help solve a problem within the context, this theory influenced solution targets advancing knowledge in the area of the digital divide as well as it contributes to practically solving a problem.

This research followed the structure of the Action research cycle, which goes into three phases (Brydon-Miller et al., 2003; Kemmis and McTaggart, 2005). First is the discovery and plan phase, where the researcher tries to understand the problem in the research context by exploring the research participants' insights through a theoretical lens. The terms discovery and plan will be used interchangeably throughout this thesis to describe this phase. Then, the research goes into the second phase, which is the Action Phase. In this phase, a solution is developed to solve the research problem by localising the theories in the literature in the research context. After that, the evaluation and reflection phase comes to appraise the solution to see how well the proposed solution was able to solve the problem. Like the first phase, the terms evaluation and reflection will be used interchangeably throughout this thesis to describe this phase.

Of course, Action research goes into multiple cycles until the problem is resolved. However, for this research only one cycle was conducted due to time limitation of the PhD program, as going into another research cycle would require more the three years. Table 1

demonstrates the process of the research in light of the Action research cycle.

**Table 1 - Action research Cycle and the Empirical Chapters**

| Action research Phase | Thesis Chapter | Description |
|---|---|---|
| Discovery | Chapter 5: The Enablers and Disablers of Inclusive Design in a Small e-Government Context | This chapter discovers the challenges of implementing inclusive design practices in the Local Council, by investigating the design issues that hinder a true inclusive application in the Council. |
| Action and Evaluation | Chapter 6: The Creation and Evaluation of the Inclusive e-Service in the Local Council | This chapter shows how the researcher and the Design team in the Council have implemented the e-service, also demonstrates how the Inclusivity Metric was used to ensure that the design is inclusive. Also, this chapter evaluate the impact of the Inclusivity Metric on the deign process and |

| | | |
|---|---|---|
| | | the impact of ease of use on the users especially older adults |

## 1.6 Thesis Structure

Chapter 1 (Introduction) is an introductory chapter that briefly explain the problem of the age-based digital divide and how inclusive design can be used as part of the solution to bridge the gap between users and non-users of ICT. The chapter introduces the research problem demonstrating the importance of investigating the age-based digital divide. Then it outlines the research questions that the research will focus on providing a scope of the issues that will be covered in the thesis.

Chapter 2 (The Digital Divide and Technology Adoption among Older Adults) provides a critical review of the literature on the digital divide and inclusive design. Pinpointing the gaps in previous research by isolating the issues the widens the age-based digital divide and drives older adults to avoid ICT, linking them benefits of inclusive design as strategy to bridge that gap. The chapter first looks at the reasons of the digital divide to build basis of enquiry. Then, it looks at the technology acceptance theories that tried to explain how users -particularly older adults- perceive the benefits of ICT and make their adoption decisions. Finally, the chapter looks at usability as a mean to improve ICT usage.

Chapter 3 (Inclusive Design) looks at the design paradigms focusing on the difference between user-centred design and inclusive design. Furthermore, the chapter looks at the importance of sensitivity toward the needs of the uses in the design process and how it is translated into the design requirements throughout the

process. Finally, it compares the methods used to evaluate the design in terms of usability and effectiveness.

Chapter 4 (Research Methodology) describes the research methodology, by first illustrating the philosophical and epistemological assumptions of this research. Then it clarifies the reasons why Action research was chosen as a research design for this thesis. Then it looks the methods used to collect data as well as the phases when these data were collected. After that, an overview of the data analysis techniques used to analyse the data.

Chapter 5 (The Enablers and Disablers of Inclusive Design in a Small e-Government Context) focuses on the empirical section of the research, which highlights the challenges faced by the Local Council while trying to adopt and inclusive design strategy to implement the Care Act 2014 on  line forms. This chapter highlights the challenges from the design team viewpoint, shedding the light main issues that hinder a full adoption of inclusive design to bridge the digital divide and reach out to the older user base. This chapter corresponds to the discovery phase of the Action research cycle, by identifying the problems to be fixed in the following chapter.

Chapter 6 (The Creation and Evaluation of the Inclusive E-service in the Local Council) describes the solution proposed to tackle the digital divide. By showing how this solution was guided by the concepts in the literature. The Chapter highlights the main constructs of the Inclusivity Metric, showing how they are linked to one another. The chapter shows how this metric was used to ensure that the e-service was inclusive and would allow users from different age groups to interact with the e-service with ease. Then it shows the results of evaluating the e-service developed by the Local Council compared with the results of another e-service that scored highly in the

Inclusivity Metric. In addition, the chapter discusses the implication of utilising the Inclusivity Metric on Inclusive Design practices. By showing how the Inclusivity Metric improved the design process within the Local Council. Furthermore, the implications on users are highlighted to demonstrate that the qualities that improves ease of use for older users as well as younger users.

Chapter 7 (Discussion) ties down the outcomes from the research with the literature. Showing how this research fills the gaps in the literature and contributes to theory as well as practice. By pinning the key findings of the research in light of the literature to demonstrate the significance of the results and their implications.

Finally, chapter 8 (Conclusion) concludes the thesis by answering the research questions raised at the first chapter of the thesis. As well as highlighting the limitation of this research to lay the path for future research. Finally, outlining the research practical and theoretical contributions.

# Chapter 2: The Digital Divide and Technology Adoption among Older Adults

## 2.1 Introduction

This chapter outlines the important research in the topic of digital divide. The presence of the digital divide in the literature will be discussed, by thoroughly analysing the causes of the divide. This chapter expands the digital divide by dwelling on each aspect of the divide, and linking it with other psychological attributes that can shed the light on new ways of investigating this phenomenon.

The digital divide is broadly defined as the gap between users and non-users of Information and Communications Technology (ICT) (Lam and Lee, 2006). The study of the digital divide in the Information Systems' (IS) literature was mainly concentrating on the gap and access inequality to ICT by investigating the difference in technology access between different demographic groups in terms of gender, ethnicity, income, countries, etc. (Bimber, 2000; Bucy, 2000; Dugdale et al., 2005). The digital divide between age groups has been receiving much interest from IS researchers due the shifts in demographics and the ICT growing popularity around the world (Lam and Lee, 2006; McMurtrey et al., 2011). However, the term has evolved over time to provide a deeper understanding of the issue rather than just access to technologies (Zillien and Hargittai, 2009).

## 2.2 Defining Access

van Dijk and Hacker (2003) expanded the phenomenon of the digital divide to address types of access to the internet and other ICT products rather than just focusing of physical access to ICT , their classifications of access types include, motivational access, material access, skills access, and usage access. Figure 2 demonstrates that access to ICT should be thought of as a dynamic and recursive

process in which a person access technology, and not a one-time event (van Dijk, 2006). Individuals immerse in the process appropriating a certain technology into their life by moving from one level to the next, and again with the emergence of a new technology.

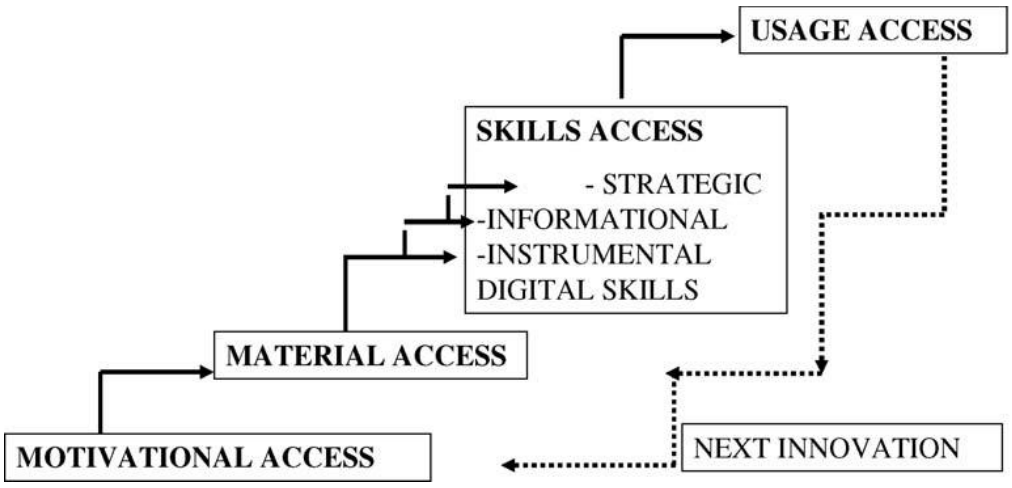



**Figure 2 - The overview of the relationships between types of access**

**Source: van Dijk (2006)**

### 2.2.1 Motivational access

This type of access addresses individuals' desire to use ICT products and be connected (van Dijk, 2006). This process happens before material access, which shapes individual's perceptions of the technology. Within motivational access lies the question of individuals' thoughts of how important this technology to them and whether they are capable of effectively using this technology in their daily lives. To further expand and deepen van Dijk's definition of motivational access, two important notions need to be discussed namely, computer self-efficacy and computer anxiety. While researchers previously have confirmed the stereotypes about older adults that assumes the they have low computer self-efficacy and high computer anxiety (Chung et al., 2010; Czaja et al., 2006; Kiel, 2005). These claims have continuously challenged due to the increasing awareness of the benefits of technology and the emergence of mobile computing with the advancements in smart

phones (Loe, 2010; Mitzner et al., 2010; Wagner et al., 2010). He and Freeman (2010) found in their study to measure gender differences in computer anxiety and self-efficacy that those two traits stem from individual's experience and exposure to such technology inclining into the notion of 'practice makes perfect' rather than biological traits.

Self-efficacy deals with one's perception that s/he can execute a certain task and achieve the desired goal from the task (Bandura, 1997). Especially since individuals tend to perform tasks that they believe they are good at and avoid those that they believe they cannot do (Lam and Lee, 2006). The notion of self-efficacy is domain specific as individuals have different perceptions of their capabilities in different tasks. Thus, computer self-efficacy is more appropriate to describe individuals' perception of their competency to achieve a certain goal using a computer system (Compeau and Higgins, 1995). Many studies have used computer self-efficacy to understand and predict individuals' attitudes to technology (Achim and Kassim, 2015; Ariff et al., 2012). According to Bandura (2010), self-efficacy is developed by the interaction of the four processes, which are:

- Enactive Mastery, which is created from one's successful previous experience. Equally, failure to perform a certain task degrades the individual's perception of self-efficacy;
- Vicarious Experience, which is created from observing 'similar others' performance;
- Verbal Persuasion, which is created from encouragement and support from others, compared with other sources of self-efficacy the effect of verbal persuasion is usually shorter;
- Physiological and Emotional State, which deals with reducing the negative state before attempting new behaviour.

From these four sources enactive mastery has the strongest effect on self-efficacy (Achterkamp et al., 2015; Ashford et al., 2010). With adequate feedback during the first attempts, the perception of enactive mastery can be reinforced thus improving self-efficacy. Vicarious experience follows enactive mastery in terms of its effect on self-efficacy, which has been proven effective with technological activities (Achterkamp et al., 2016). Even limited experience with computers can have beneficial effects to computer self-efficacy among older adults. However, the strength of the effect will become more long lasting if the interaction was deemed positive (Czaja and Sharit, 1998). Highlighting the benefit and the simplicity of technology through training has been reported as the main facilitator to computer self-efficacy, more importantly training need to be coupled with practice in order to reap the benefits of the training sessions (Byrne et al., 2016; Campbell, 2004; Wild et al., 2012).

On the other hand, there are three types of anxiety namely, state, trait and concept-specific. State anxiety, is a temporary unpleasant feeling when a person is confronted with a situation that is perceived as a risk, usually this feeling disappears as soon as the situation is resolved. Trait anxiety is similar to state anxiety except for the duration in which this type of anxiety last for, generally trait anxiety is the difference between a person's tendencies to experience state anxiety from the other. Finally, concept-specific anxiety is a type of anxiety that specific to certain activity and it ranges from trait to state anxiety (Saade and Kira, 2009). Computer anxiety is a concept-specific anxiety that deals with the negative effects that people experience when using computers, due to their fear to damage the computer or look silly once they committed a mistake which will affect their performance in computer related-task (Barbeite and Weiss, 2004; Bozionelos, 2001; Parayitam et al., 2010). Computer

anxiety mediates the relationship between older adults and their attitude towards technology, thus addressing this issue can improve older adults' usage of technology (Mitzner et al., 2010). Chu (2010) found that family support can significantly decrease older adults' computer anxiety, family member can play a vital role in reassuring older adults about the benefits of technology as well as ensure that they are able to securely conduct transactions online. Moreover family members are one of the main drivers for older adults to use technology in order to stay connected with them as well as to bond with them (Lian and Yen, 2014).

Computer self-efficacy and computer anxiety are related constructs that affect individuals' attitudes to technology (Celik and Yesilyurt, 2013). Linking computer self-efficacy and computer anxiety to van Dijk (2006) motivational access. Access can be improved by adjusting older adults' attitudes towards technology through encouragement and effective reinforcement. In addition, it is equally important to educate older adults about security and privacy threats on the internet. While providing them with knowledge and tools to enable them to protect their sensitive information (Wilkowska and Ziefle, 2011)

It is also important to discuss the effect of culture on motivational access in order to fully investigate the sources and drivers of digital divide. cultural differences between markets have to be carefully examined especially when it comes to technology related issues, especially since culture can affect the way individuals perceived the technology (Im et al., 2011; Venkatesh and Zhang, 2010). Psychological and sociological issues can also affect older adults' attitudes toward using technology; issues like self-efficacy and culture have similar affect to physical and cognitive issues. Hofstede (1980) defines culture as "the collective programming of the mind

that distinguishes the members of one group or category of people from another". On the other hand, measuring the effects of culture can be deemed as a very difficult task. As the effects of culture are not obvious as one would think, and it needs a proper understanding to know which element can considered a valid measurement of culture (Ford et al., 2003).

Issues like individuals' perceptions of independence can play an important role on technology adoption (Sayago and Blat, 2008). The current research in technology adoption among the older adults in particular have attributed independence as the main driver of technology adoption (Marcellini et al., 2000; van Dyk et al., 2012). However, the notion of independence vary within cultures and even within time, as Long (2012) found in her longitudinal study about the meaning of relaying on assistive technology for seniors in Japan, that the Japanese seniors' perceptions of independence have changed through the years. Historically the role of taking care of the elder parents in Japan was the job of the daughter-in-law. However, in the midst of economic changes and calls for modernism and in the Japanese society, the value of independence has been reinforced among older adults. Individuals from eastern cultures tend to be more holistic and interdependent, as they value hierarchy and centralism. On the other hand, individuals from western cultures tend to be individualistic and independent (Nisbett and Miyamoto, 2005).

Also, it is important to consider other psychological issues that affects technology adoption like, cognitive age which deals with individuals' self-perception of how old they feel, act, and look regardless of their chronological age (Barak and Schiffman, 1981). The idea of cognitive age was studied extensively in the field of marketing, to explain how individuals make their purchasing decisions based of their perception of how old they think they are,

which is valuable to further segment the consumer market (Barak, 1998). It is important to note that cognitive age has an effect on most age groups not only the older adults. While it is understandable for older adults to try to disassociate themselves from the stigma of getting old by exhibiting younger cognitive age, younger individuals exhibit older cognitive age due to their desire to be viewed as independent and responsible adults (Montepare and Lachman, 1989). Both notions deal with individuals' aspiration to defy social stereotypes associated with ageing. Logan et al. (1992) studied the life events that would change the individuals' perceptions of how old they feel, they found that not only health is a strong predictor of individuals' cognitive age but the role that individuals play in the in their daily lives have an effect of individuals' cognitive age.

The study of cognitive age in technology adoption has not received enough attention in the field of IS. Most of the work associated with technology adoption relied heavily on system features and design and the ways to improve them to achieve higher adoption, while ignoring the role of human factors and their role in technology adoption (Hong et al., 2013). Czaja and Lee (2007) suggest that chorological age is not sufficient to indicate technology acceptance, adoption among the older adults as this group is highly heterogonous, and ageing is individualised. With the current trend to interdisciplinary studies in most highly ranked academic journals, more researchers are investigating physiological and sociological issues and their implications on technology. Few researchers looked at the differences between individuals' perceived cognitive age and their technology adoption behaviours, and found that individuals who exhibit younger cognitive age tend favour adopting technology (Eastman and Iyer, 2005; Hong et al., 2013)

### 2.2.2 Material access

This deals with individuals' physical ability to access technology whether through purchasing it or visiting a location where the technology is available (van Dijk, 2006). This is the most discussed type of access in the digital divide literature due to its easiness to identify. Many researchers have been able to investigate the inequality to access technology based on different demographic characteristics like gender, and ethnicity (Cruz-Jesus et al., 2016; Lin et al., 2015; Novo-Corti et al., 2014). Access to technology has significant correlation with the economic state of the country, thus the developed countries has higher access to technology than developing countries (Zhang, 2013). While evidence suggests that, the gender gap in access to technology has reduced significantly (Wasserman and Richmond-Abbott, 2005). Moreover, age has been considered one of the prominent predictors for internet access across Europe (Brandtzæg et al., 2011).

While these factors are still relevant, they do not significantly affect older adults' adoption of technology (Selwyn et al., 2003). Due to the strong technology infrastructure in many countries accessing technology has become easier than ever, even in less developed countries technology access is less complicated with the help of mobile technologies. Again, what is important here is the level in which older adults utilise technology in the daily activities –usage access- rather than looking if they have internet connection at home or if they own a mobile device. Since owning a certain ICT product does not necessarily translate into using this product (DiMaggio et al., 2004; Hargittai and Hinnant, 2008). Fixating on whether older adults have internet access or own ICT device can lead to the assumption that the digital divide is bridged and there is no need for further research on this area (Hilbert, 2016). The issue that need to be addressed is how technology is used rather than if it is used, this

notion is referred to as the second-level digital divide (Büchi et al., 2015).

### 2.2.3 Skills access

This deals with individuals' ability to operate and understand ICT products (van Dijk, 2006). Unlike the financial and motivational barriers to access technology that have been significantly lowered in recent years, skills and usage access are the remain the key contributors to the digital divide (Hilbert, 2016). After the motivation to use technology is created, and material access to this technology has been established, individuals need to learn how to use this technology in order to benefit from it.

van Dijk (2006) further expands the notion of skills to operational skills, informational skills, and strategic skills. These type vary based on the person's ability to use a certain technology, they range from a simplistic view of a person ability to use hardware and software i.e. operational skills to the ability to use technology to achieve a certain goal i.e. strategic skills. Similar to the notion of computer self-efficacy discussed in Section 2.2.1 Motivational access, skills access can be improved by training and informal trials of technology (Pick and Nishida, 2015).

On the other hand, technologies need be less demanding so older adults are able to use them without a big learning curve (Charness and Boot, 2009). This changes the emphasis from older adults and training programs to the technology design. Design paradigms discussed in Chapter 3 outline different philosophies to make technologies easier to use, thus meeting the older adults half way. Improving design practices to ensure that lower levels of effort needed to perform a certain task on a technology is key to allow older

adults to fully utilise technology, therefore maintaining person-technology fit (Junglas et al., 2008; Mathieson and Keil, 1998).

In order to comprehend the issue of technology adoption among older adults, one must develop a deeper understanding of the effects of ageing on people and the needs of this age group. Fisk et al. (2012) emphasised the effects of ageing on three areas:

1. Sensory modalities: deal with taste and smell, hepatics, audition, and vision;
2. Cognition: deals memory, attention, spatial cognition, and understanding spoken written language;
3. Control of movement

The matter is further complicated since older adults are more likely to suffer from age related illnesses that affect their physical and cognitive capabilities (van Dyk et al., 2012). Thus reinforcing the older adult's position to avoid technology because failing to do simple tasks, using technology will have a negative effect on their self-esteem that will ultimately result in technology resistance. However, given that older adults are not a homogeneous group; as the effects of ageing can be substantially different due to many circumstances like health care issues, educational level, and economic conditions.

### 2.2.4 Usage access

Which deals with the actual usage and appropriation if ICT products in individuals' lives (van Dijk, 2006). Usage access is the final stage of technology access that translate to actual usage. Especially since being motivation, skills, and physical access does not necessarily translate into usage of the technology. van Dijk (2006) outlined how usage access is measured:

1. Usage time: through usage diaries as they are more reliable than usage statistics;

2. Usage applications and diversity: through comparison of the applications used by different groups;
3. Broadband or narrowband use: Technology usage over broadband connections provide more opportunities to take advantage of the benefits of technology;
4. Active or creative use: which move beyond passive use of information to production of creative material online.

Through this cyclic movement from each phases of access, people can appropriate technologies into their life, and this cycle continues for with the emergence of new technology (van Dijk, 2006). Other researchers have looked at other access problems like political and financial issues (Guillén and Suárez, 2005; Hilbert, 2010). However, these are not relevant to the issue of the age-based digital divide.

## 2.3 Technology Acceptance Theories

Moving from the focus of access, to the technology adoption theories that tried to explain why people adopt technology. Since ICT has been a focal point for many organisations around the world, as a mean to cut down expenses and maintain a competitive advantage (Peters et al., 2016). While organisations recognise the value ICT projects can bring to them, there is a tendency for ICT projects to go beyond the time and budget or suffer from users' resistance (Fell, 2013; Linberg, 1999; Pinto and Mantel, S.J., 1990; Robertson and Williams, 2006; Yeo, 2002). One of the main reasons why ICT projects fail is the low usage rate from their intended users (Kim and Kankanhalli, 2009). The need to understand the reasons why individuals adopt or resist technology was recognised by researchers like Davis (1989) who developed the first Technology Acceptance Model (TAM), these theories tend to focus on the motivational access,

since they look at the motives that form one's intention to adopt technology (Niehaves and Plattfaut, 2014). In this section, theories that explain technology adoption are explained to provide basis of enquiry about the digital divide.

### 2.3.1 Technology Acceptance Model (TAM)

It has been widely used to predict the technology adoption behaviours by looking at the effect of its construct on a certain group (Leong et al., 2013; Pan and Jordan-Marsh, 2010; Wallace and Sheetz, 2014). Figure 3 shows the constructs of TAM, these constructs are Perceived Ease of Use, Perceived Usefulness, and Attitude toward Using the System (Davis, 1989). Perceived ease of use is the degree by which an individual's beliefs that using the system would be free from effort, perceived usefulness is the person's beliefs using the system can improve his/her job performance. These two constructs shape the person's attitude toward using the system, which in turn creates a behavioural intention to use, that ultimately translates into actual use (Davis, 1989).

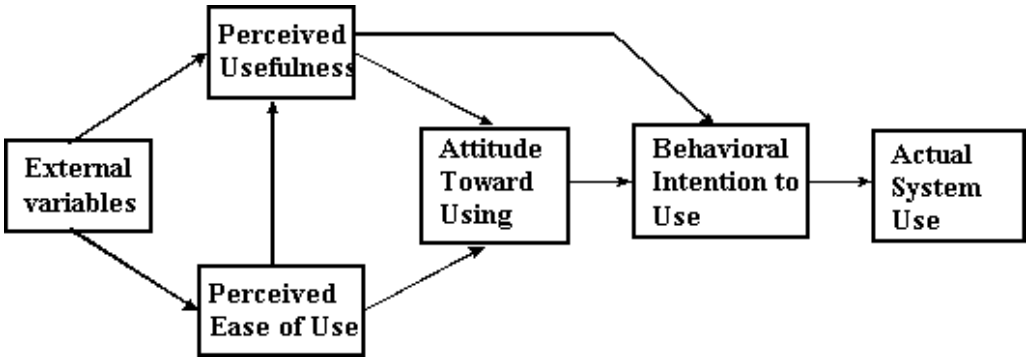



**Figure 3 - Technology Acceptance Model's Constructs**

**Source: Davis (1989)**

TAM tries to predict and explain why individuals use ICT effectively. TAM is considerably easy to use in research that explains its popularity amongst researchers (Mathieson, 1991). Even though

TAM is considered one of the prominent theories in the field of IS, it has received its fair share of criticism. Such as its inability to take into account cultural (Sun and Zhang, 2006). TAM was also criticised for its lack of focus on usage context, as TAM was mainly concentrating on technology acceptance in the work place (Abdullah et al., 2016; Wu et al., 2011). With the current changes in the technological scene, and the ever-growing strength of personal computing. TAM needed to be changed to incorporate more constructs that reflect the difference of personal use and professional use.

Bagozzi (2007) criticised TAM and its extensions for adopting a very simplistic approach to explain human decision making process which attracted many researchers to utilise the model in their studies, he claimed that the current technology acceptance models are not "deep" enough to explain why a certain construct is important in adopting a certain technology. In addition, one of the main criticisms is TAM reliance of self-reported system usage instead of actual usage. Self-reported usage is a subjective measurement that can affect the results and the overall conclusions (Chuttur, 2009; Yousafzai et al., 2007).

Venkatesh and Davis (2000) defended TAM by extending it and proposing TAM2 which includes constructs that address social influence (i.e. subjective norm, voluntariness, and image), cognitive instrumental processes (i.e. job relevance, output quality, and result demonstrability) and experience. Figure 4 shows the relationships between these constructs and the overall effect on technology acceptance. Venkatesh and Davis (2000) claim that TAM2 can provide superior explanation to technology adoption as their model can explain 40% of the variance in the usage intentions.

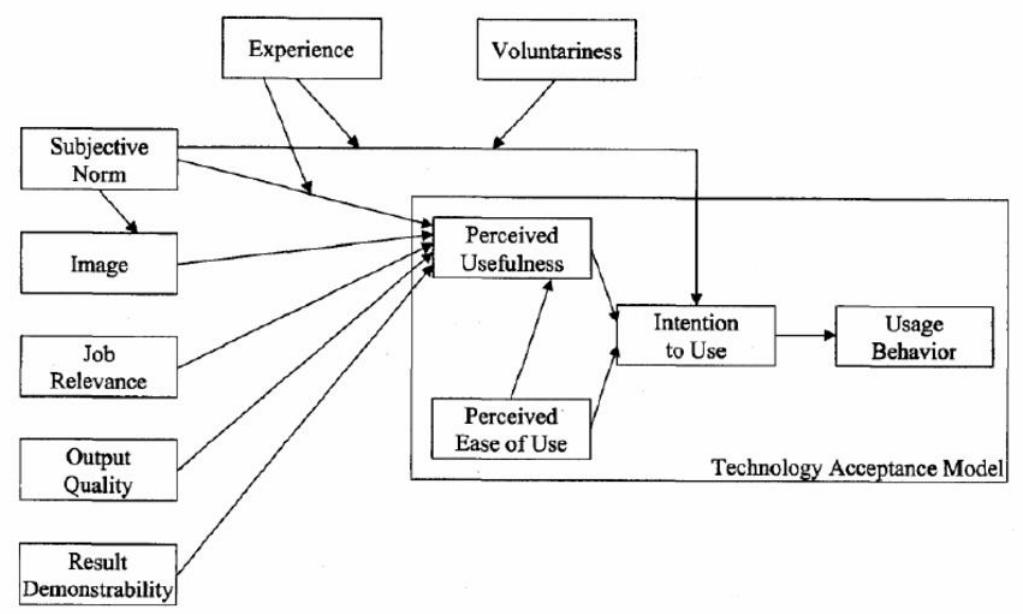



**Figure 4 - Extension to the Technology Acceptance Model TAM2**

**Source: Venkatesh and Davis (2000)**

### 2.3.2 Unified Theory of Acceptance and Use of Technology

The theory was created through merging the constructs of eight models that explained IS usage behaviour which are: theory of reasoned action, technology acceptance model, motivational model, theory of planned behaviour, a combined theory of planned behaviour/technology acceptance model, model of PC utilisation, innovation diffusion theory, and social cognitive theory (Venkatesh et al., 2003). The theory suggest that four key constructs which are performance expectancy, effort expectancy, social influence, and facilitating conditions as the main determinants of usage intention and behaviour (Venkatesh et al., 2003). Gender, age, experience, and voluntariness of use have a moderating effect on the four key constructs on usage intention and behaviour (Venkatesh et al., 2003). Subsequent validation of UTAUT in a longitudinal study found it to account for 70% of the variance in usage intention (Venkatesh et al., 2003)

While UTAUT was used in many studies to show the explain the differences in in technology acceptance (Lin and Anol, 2008; Marchewka et al., 2007). UTAUT also has been criticised for their irrational labelling for the social influence and the facilitating conditions constructs, as they group unrelated items to explain a single construct (van Raaij and Schepers, 2008). Although UTAUT included age as moderating factor to technology adoption, it was mainly used as a demographic control variable without showing the effect of ageing in technology adoption.

Even though technology acceptance models (like TAM, TAM2, UTAUT, etc.) have a cultural and social influence components, Bagozzi (2007) argued that these models only focus on individuals decisions to adopt technology and does not take into account the individuals' desire for conformity with a certain group. Especially with the evidence of informational cascades in the field for technology adoption, by which individuals choose to follow others and adopt certain technologies with disregard to their needs (Duan et al., 2009). Technology acceptance models fail to explain the situations in which people can behave irrationally just to conform to others (Bagozzi, 2007).

## 2.4 Activity Theory

In order to understand how to improve utility of technology one have get a proper understanding of how people use technology. Activity Theory is one of the main theories used in HCI research to explain human behaviour with ICT (Chen et al., 2013). It is important first to distinguish what is Activity Theory and what is not. Activity theory is a descriptive theory that tries to explain the processes that occur during the interaction between an object and subject to achieve a certain outcome. Activity Theory should not be thought of as a predictive theory that predicts how people behave whilst trying to

achieve the outcome (Kaptelinin and Nardi, 2006). Activity theory has been applied in many areas like work design, and education (Roth, 2004). In the 90s it was extended to HCI to study the appropriation on technology into people's work (Bardram and Doryab, 2011; Kaptelinin and Nardi, 2012).

Within Activity Theory, people are treated as social actor within the system and just user of the system. A range of social and political constraints in which the system operates in to allow these social actors to achieve a certain outcome governs them. According to Nardi (1996) Activity Theory is "a philosophical and cross-disciplinary framework for studying different forms of human practices as development processes, both individual and social levels interlinked at the same time".

The unit of analysis used in this theory is motivated activity that is done to an object to achieve a specified goal. Thus, Activity Theory's main assumption that an activity is purposeful actions to achieve a certain goal, while maintaining the interplay between the elements in that affects this activity like rules and cultural norms. Activity Theory differentiates itself from other theories by situating the unit of analysis –the activity- within the context in which the activity will be performed in (Hasan, 1999). Thus taking into account cultural issues that arise from or during the activity. Especially since the basic assumption of the Activity Theory is that it is not possible to understand actions by isolating them from their context in a laboratory type experiments.

The main constructs in the Activity Theory are the subject, object, and the outcome. However, the interaction between the subject and the object is not isolated from its context. These elements all interact within the boundaries of context they interact in. This

interaction can either be tangible (i.e. writing a letter) or intangible (i.e. formulating a plan), mediated by constructs that affect the outcome of the activity. These mediating constructs regulate the relationship between subject and objects within a context.

For an activity to be achieved it has to go through some several actions and operations. This relationship is dynamic and as it moves from operations to actions and vice versa. This can be helpful for HCI as it allows the designer to look at the activity as a whole and not be fixated about the small steps to fulfil the activity. This also can be looked at as guide to communicate high-level goals from the users and senior management and reflect them on the proposed the system.

Recently Activity Theory use in IS has matured (Chen et al., 2013; Ditsa, 2003). An area where Activity Theory was used is on technology-facilitated change and the implementation of technologies and how they change organisational work activity whether positively or negatively. In these studies, activity systems are used to understand conflicts in the work activity, which are fixed using IS (tools) or introduced by implementation of the IS (Allen et al., 2013). Likewise, Information science studies use Activity Theory to understand information behaviour within the specified context (Allen et al., 2011; Wilson, 2008). The field of system design and development also uses of activity theory to inform development of IT systems and to study of ICT in within its development context (Korpela et al., 2002).

Activity Theory highlights the importance of person-technology fit by deconstructing the interaction and reconstructing it again to make it more appropriate for as many users as possible. With the Activity Theory as the main driver to guide the steps required in the

system in order to ensure that the activity corresponds with logic. Activity Theory describes all human activities having to involve a type of tool whether physical tools like pens, and computers or psychological tools like language, and ideas (Hasan, 1999). Therefore, the tool that enables people to perform activities has to comply with the needs of the person to allow him/her to achieve the goal effectively and efficiently. The tool in HCI context case is the system. This system (tool) has to be able to capture all the information required from the user (subject), in order to achieve certain objective like booking a ticket (object) for this person while ensuring the integrity of the transaction (rules) as seen in Figure 5 - Activity Theory's constructs

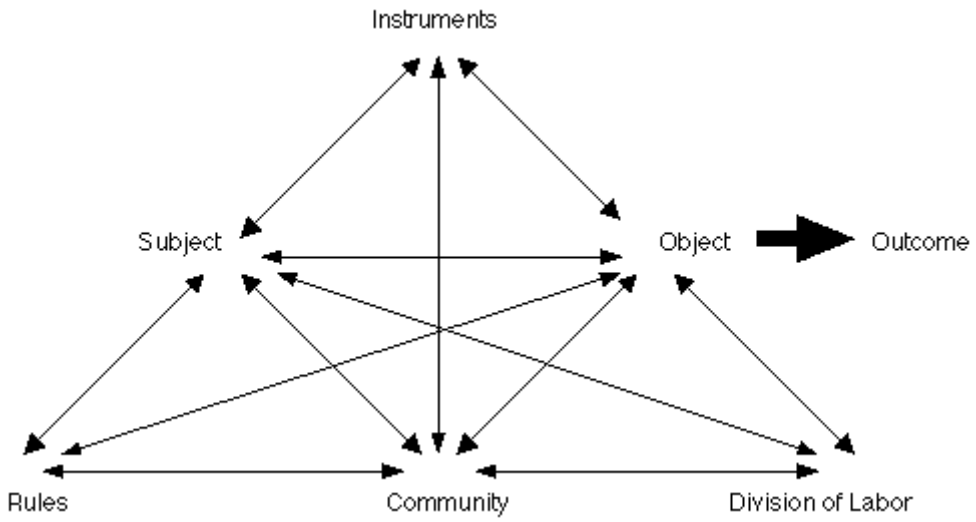



**Figure 5 - Activity Theory's constructs**

**Source: Bardram and Doryab, 2011**

## 2.5 Usability

Moving on to the notion of usability in IS, usability is coined as a main contributor to systems success (Harrati et al., 2016; Ma et al., 2016; Markus and Keil, 1994). ISO 9241 (1998) defines usability as: "The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction

in a specified context of use". Within this definition holds three important attributes of usability that are effectiveness, efficiency and satisfaction. To fully understand these attributes ISO defines effectiveness as "accuracy and completeness with which users achieve specified goals", efficiency as "resources expended in relation to the accuracy and completeness with which users achieve goals", and satisfaction as "freedom from discomfort, and positive attitudes towards the use of the product".

### 2.5.1 Usability Constructs

In order to have a more comprehensive definition of usability, five characteristics need to be included to expand this definition, which are effectiveness, efficiency, error tolerance, and ease of learning.

#### *2.5.1.1 Effectiveness*

Effectiveness is the completeness and accuracy with which users achieve specified goals. This can be judged based on whether the users were able to achieve their goals from using the system, also whether the transaction is deemed accurate.

While effectiveness is often confused with efficiency, they both have different aims than each other. Efficiency mainly targets the timeliness of transaction and how fast it can be achieved with minimal resources, on the other hand effectiveness targets how well the transaction is done. As a matter of fact, these two features are not required in all transitions. Depending on the nature of the transaction the design team should decide which one is more important than the other (Frøkjaer et al., 2000).

The help and user assistance provided in the interface can have a strong effect of the overall effectiveness of the interface. The

effectiveness also can be improved by the presentation and aesthetics of an interface, so if the information provided in the interface is visible and clear to the user the transaction is more likely to run with little to no problems. Also another important note is to ensure that the interface is designed in the users' language and does not contain jargon that some users may not understand.

#### *2.5.1.2 Efficiency*

Efficiency can be described as the speed in which users can complete the tasks they used the product or service for. ISO 9241 defines efficiency as the total resources expended in a task. Efficiency can be measured by the number of clicks or keystrokes required or the total time spent on a task

The interface should also provide some transaction accelerators like keyboard shortcuts, menus, links and other buttons. All of these elements mentioned above can have a significant effect on efficiency if used effectively. Thus the users will require less time to achieve the tasks they want. This all depends on understanding how the users work. So in order to decide which accelerator should be used the task needs to analysed and thoroughly thought of (Jeng, 2008).

#### *2.5.1.3 Engagement*

If the interface provides a pleasant and satisfying experience for the user than it is considered engaging. The visual design is the first thing that users see when they interact with an interface. The layout of the interface the elements used in it like graphics, fonts and its organisation can have a lasting impression on the users and would allow them to enjoy the interface instead of just use for the task on hands. Equally important is the style of the interaction which might

range from a game-like simulation to a simple menu-command system.

These qualities must be appropriate to the tasks, users and context. Especially since the design style for an e-commerce website will be completely different from an interface where specialists do their work activates. Even within the same class of interfaces, different users may have completely different requirements. What is important is that the design meet the expectations and needs of the people who must use the interface (Frøkjaer et al., 2000).

#### *2.5.1.4 Error Tolerance*

Ideally the interaction should go without any errors. However, it is in human's nature to commit errors and it is completely normal since neither people nor computers are perfect. A good response to that would be a system that first does not allow users to commit mistake and if they do guide them to overcome these errors through informative feedback.

To improve usability the interface should be built to identify these mistakes to the users, and show them what are the appropriate data for each element in the interface. However, it is equally important to put in mind that designers also can commit design mistakes that does not take into consideration the full range of possible answers that the users may provide. Therefore it is always important to leave space for the users to express themselves in some form. This allows the user to feel more secure of their transaction, thus trust the system and visit again or recommend to friends. For errors beyond the control of the interface (i.e. system failures), the interface should calmly inform the user through the process to help them recover from the problem (Sayago and Blat, 2008).

#### *2.5.1.5 Ease to Learning*

Creating an easy to learn interface that offers a low entry barrier does not always translate to less powerful system that cannot be sustained for long period of time. An interface which is easy to learn allows users to build on their knowledge without deliberate effort (Barnard et al., 2013). This goes beyond a general tips and advice to include built-in instruction for difficult tasks.

### 2.5.2 Main Usability Principles

There are many usability principles in the literature; however, the most followed principles are the ones created by Nielsen (1994a), Norman (2005), and Shneiderman (2004). In this section, the main usability guidelines are addressed showing each main contributors and then comparing them against each other to see which areas were covered by each guideline and what are the areas that they all agree on.

#### *2.5.2.1 Nielson's Usability Heuristics*

Nielsen (1994a) introduced 10 usability principles to ensure that systems have high levels of usability. Nielsen's heuristics are probably the most-used usability heuristics for user interface design. These usability principles are:

1. Visibility of system status: The user should always be aware of what is going on in the system. This can be done by providing timely feedback that informs the users of the status of their transaction.

2. Match between system and the real world: The interface should avoid system and technical jargons and terms. In

order to match real world with the system; the information provided in the interface should be similar to the terms used by the users as well as the concepts the interface uses.

3. User control and freedom: if the users commit a mistake they need to be assured that there are features provided in the interface to allow them to undo the mistakes they have done without compromising the information they already provided. This way the users are given the opportunity to avoid redo the whole transaction just for the sake of simple mistake.

4. Consistency and standards: The user should have a sense to continuity in the interface, meaning that the actions required for similar types of data should be taken the same so the users do not have to guess how to input certain data.

5. Error prevention: First thing the designers should have in mind is error prevention. Thus they need assess all questions and data entry points to ensure that the question allow the user to commit mistakes. The second thing to think about is clear and informative error messages that informs the users about correct their mistakes.

6. Recognition rather than recall: The use of the users' memory should be kept at an absolute minimum, this can be done by making all the interface elements visible so they do not have to remember where they are. Again the consistency of the interface plays an important role to reduce the need to remember what to do in each question.

7. Flexibility and efficiency of use: the interface should have accelerators –not to be seen by the novice user- to quicken the interaction for the expert user in order to all the system can cater to both inexperienced and experienced users.

8. Aesthetic and minimalist design: only relevant and necessary information should be displayed in the interface. By accumulating bits of information the relevancy of the information displayed get lower thus the user might skip some part which may be important for him/her.

9. Help users recognise, diagnose, and recover from errors: Error messages should be expressed in plain language with no codes or mysterious language, the messages need to inform the user exactly what the problem is, and suggest a solution accordingly.

10. Help and documentation: All the information about each task should be easily searchable, and list explicit steps to be done to fulfil the transaction in a short manner without overwhelming the user.

#### *2.5.2.2 Shneiderman's Eight Golden Rules*

Shneiderman are also considered one of the frequently used usability principles (Shneiderman and Plaisant, 2004). His eight rules are:

- Strive for consistency: Consistency in terms of sequences of actions in similar situations, terminology, and consistent commands should be employed throughout.

- Enable frequent users to use shortcuts: This would quicken the interaction for expert and frequent users, by using hidden key shortcuts.

- Offer informative feedback: for small errors that are done frequently the feedback should be subtle and unintimidating, while for infrequent and major actions, the response should be more significant.

- Design dialog to yield closure: The transactions and the list of actions should be grouped and organised to take the form of beginning, middle, and end. The users will have a sense of relief if informative feedback is given to ensure the user that the transaction has been done successfully.

- Offer simple error handling: Initially the interface should be designed to not allow users to commit big errors, but if they make any errors the interface should provide them with sufficient feedback to inform them about the error and how to correct that error.

- Permit easy reversal of actions: enable the users to retrace their steps to correct any errors or verify the data they entered. This would relief a lot of anxiety on the users' side knowing that they can verify the information especially is the transaction has sensitive information.

- Support internal locus of control: Some expert users want to feel in charge of the transaction. The interface should have the flexibility to handle customised paths that they might want to take.

- Reduce short-term memory load: The interface should limit the use of short term memory by keeping the information displayed simple, providing sufficient training time for codes and shortcuts, grouping multiple page, and reduce window-motion frequency.

#### *2.5.2.3 Norman's Seven Principles*

Norman (2005) developed his design principals to improve the design of items and interfaces we use every day. His principles are:

- Visibility: The functions of the interface should be visible and clear so that users are able to use them. If they are not, then the likelihood of the users missing them out is increased significantly.

- Feedback: ensures that the action is acknowledged so the user know that his/her action has been recorded to avoid repetition of the action. This allows the user to know that s/he are still in an active interaction. Feedback can take many forms audio, visual, tactile, or a combination of them

- Constraints: Where a set of constrains hinder the user from entering wrong data or doing an unnecessary action.

- Mapping: This deals with the link between interface elements and the real-world equivalent. For example the use of radio buttons that turn on and off to resemble the light switches in a real house.

- Consistency: This deals with designing interfaces to have similar operations for accomplishing similar tasks. Like when using the same operation to select objects from a list by ticking the checkbox on the left of the text. Inconsistent interfaces would have some on the left and some on the right.

- Affordance: means that a feature of an object allows users to know how to use it. Like a faucet invites people to turn to get water. The shape of the faucet gives a clue to the person on how it is used. If the affordance is obvious then a person can use the item easily without any efforts to understand how it works.

#### *2.5.2.4 Comparison between the Usability Principles*

In order to see the full picture of what each guideline covers in terms of usability, Table 2 - Comparison between Usability Guidelinesbelow shows the main attributes of each guideline in order to distinguish between them.

**Table 2 - Comparison between Usability Guidelines**

| | Nielson's Usability Heuristics | Shneiderman's Eight Golden Rules | Norman's Seven Principles |
|---|---|---|---|
| Status visibility | X | | X |
| Link between real-world and interface elements | X | | X |
| User control of transaction | X | X | |
| Consistency | X | X | X |
| Error prevention | X | X | X |
| Efficient memory use | X | X | |
| Flexibility for expert users | X | X | |
| Aesthetics | X | | |
| Error correction | X | X | X |

| | | | |
|---|---|---|---|
| Provide help and feedback | X | X | X |
| Transaction logical sequence | | X | |
| Affordance | | | X |

## 2.6 Summary

In this chapter, a discussion of the technology acceptance theories and the digital divide is presented. First of all, the notion of the digital divide is discussed to show what is mean by the digital divide and what its main drivers are. Uncovering levels of access to technology that enables older adults to access technology. After that, technology acceptance theories were introduced to demonstrate how technology acceptance has been theorised in order to take the important parts into account during the implementation of the e-service as well as show the research gap that this research is designed to close. Moreover, this chapter showed what is meant by usability and demonstrated how usability can improve technology adoption among older adults. In summary this chapter was able to demonstrate the usability can facilitate technology usage for older adults, therefore enable researcher to bridge the digital divide.

# Chapter 3: Inclusive Design

## 3.1 Introduction

This chapter introduces the design paradigms available to promote designing for older adults. The chapter first highlights User-cantered Design and Inclusive Design in an attempt to show the main similarities and differences between those two approaches. Then the chapter demonstrate how Inclusive Design can be used to promote users' empowerment and appreciation of the users' diversity. Finally, the chapter shows how designs are evaluated to see whether they were able to satisfy the main principles of Inclusive Design.

## 3.2 Design Paradigms

While most organisations pour their resources towards creating an online presence to interact with their customers, the needs of older adults are not nearly met with those online services (Charness and Boot, 2009; Marcellini et al., 2000). Considering that older adults are not constituting a significant customer base online, this have encouraged organisations to design online services that appeal to their younger customers who are more likely to use them due to their familiarity with online services. However, this is changing due to the current and future increase of older adults' usage of the internet (Vošner et al., 2016).

Design strategies like the use of metaphors have been utilised extensively in the technology field especially when designing user interfaces (Celentano and Dubois, 2014). These metaphors simplify the interaction with different technologies by mapping the interface with the user's prior knowledge in the real-world, these strategies could potentially widen the digital divide if not used wisely, because older adults did not grow up with those technologies that young people nowadays use and their experience and previous knowledge

differ substantially (Hekkert and Cila, 2015; McMurtrey et al., 2011). Those older adults were brought up from a different technological era called Electro-Mechanical (EM) era where most interfaces had a one-to-one relationship with their intended outcome, unlike the Digital-Software (DS) era which mainly concentrate on multi-layered menu interfaces, and those interfaces have one-to-many relationship with their intended outcomes (Lim, 2010). This puts older adults under the risk of not comprehending the purpose of the technology and how to physically interact with it. Especially with the use of novel gestures that are unnatural to the average user, just to showcase the company's engineering excellence with complete disregard to the value of the gesture and how it can help make the interaction intuitive and natural (Norman, 2010).

Moreover, current Graphical User Interfaces (GUI) places great emphasis on aesthetics and little on utility. Even though the effect aesthetics influence can sometimes exceed the effect of utility and usefulness in software and hardware design, Norman (2005) argues that designing appealing items whether technology or non-technology products, would influence individuals' preferences to use certain products. However, Tuch et al. (2012) found that this is not always true as aesthetics is a very subjective matter and can differ from one person to another. What is considered to be a beautiful interface for a certain age group can be considered very difficult to use for another age group, as many designers fall in the mistake of designing for themselves without considering the unique needs of users (Lim, 2010). Czaja and Lee (2007) argue that many designers do not consider older users when they design user interfaces, and thus do not consider age related changes in the users' capabilities.

While there are procedural and philosophical differences between Inclusive Design and User-centred Design methodologies,

they both focus on improving design usability (Astbrink and Beekhuyzen, 2003). Figure 6 – User types based on abilitiesdemonstrates the type of people in that users' design for, in the bottom which represents the largest percentage of users is the users who do not have any conditions that would hinder their ICT use. This users group does not require special attention when it comes to UI design. However, as we go up the pyramid the users' needs and the design requirements change. At the top of the pyramid is a niche user group with specialised UI requirements that often relay on the use of assistive technologies. While User-centred Design tries to address the needs and provide UI for services that especially cater for users in each level of the pyramid. Inclusive Design tries to address only the two bottom levels in a unified way assuming that if the needs of the middle level are satisfied the needs of the bottom level will be satisfied automatically. Moreover, Inclusive Design does not try to include the needs severely disabled users as they are more likely to drastically change the UI and these needs are satisfied by the use of assistive technologies.

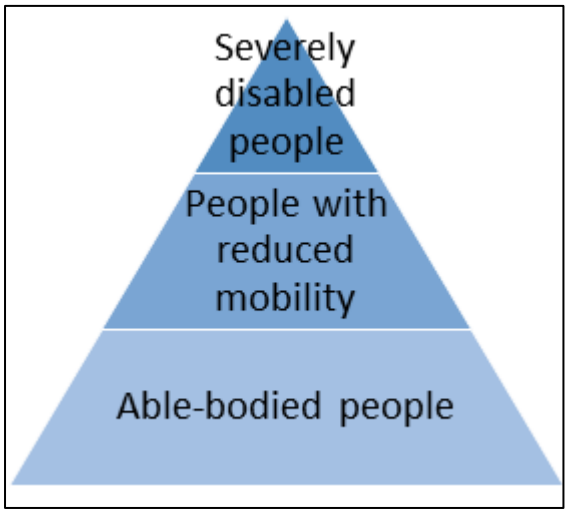



**Figure 6 – User types based on abilities**

**Source: Microsoft, 2003**

In the coming sub-sections the philosophical and procedural differences and seminaries between Inclusive Design and User-centred Design will be introduced, by first explaining the definitions of each design approach, then outlining the design principles, and finally highlighting the strengths and weaknesses of each design approach.

### 3.2.1 User-centred Design (UCD)

While this approach places more emphasis on user involvement in the design process, by investigating the needs of the users and build a UI that satisfies these needs. However, the UI designed might not be useful to a big variety of users (Newell and Gregor, 2002). By this active involvement of users designers can gain clear understanding of how and why the users will use the UI, and thus prioritise the things that have more significance to facilitate a smooth interaction with the UI (Astbrink and Beekhuyzen, 2003).

With UCD the needs of the users have more weight in the design decisions than the requirements of the task to be performed or the designers, this is very important especially in the context of e-government as governments use the UCD philosophy to prove the needs of the users are at top of their priorities and to demonstrate active citizenship and democratic practices in form of online services (Kotamraju and Geest, 2012). This shows that the government is committed to deliver services that provide flexibility and convenience to the users, and not strengthen bureaucratic practices. The involvement of users in the UCD is being done by undertaking the following:

1. Set business goals
2. Understand users
3. Assess competitiveness

4. Design the total user experience
5. Evaluate designs
6. Manage by continual user observation
   (Vredenburg, 2002)

However, anticipating the users of the UI can be hard as the designers has make assumptions as to who is going to use the service and then ask them to be involved in the design. This can be difficult if the service at hand is going to be used by many users from different backgrounds and capabilities. The designers have to make some pragmatic decisions to select the sample of users that can represent the entire population so users, and define their involvement in the design. Even if the involvement of the users has been deemed successful, the end result might not be as tailored to users' needs as it intended to be. As user involvement does not always guarantee successful implementation (Newell and Gregor, 2002).

Moreover, labelling a UI as made exclusively for older users can be a turn off for younger and older users. The psychological issues must be addressed as well, so users do not feel inferior or stigmatised when using the UI, as this will lead to marketing problems and low usage of the service or website (Keates et al., 2000).

### 3.2.2 Inclusive Design

Inclusive Design has always been embraced in the architecture field (Astbrink and Beekhuyzen, 2003). While it is grounded in the field of architecture and environment design its principals still apply to the field of HCI. Story et al. (1998) outlines the seven principals of Inclusive Design as follows:

1 **Equitable use:** The design is useful to users with different abilities

2 **Flexibility in use:** The design accommodates different users' preferences
3 **Simple and intuitive Use:** The use of the design is easy to understand regardless of users' experience.
4 **Perceptible information:** The design communicates necessary information effectively.
5 **Tolerance for error:** The design minimises hazards and the adverse consequences of accidental or unintended actions.
6 **Low physical effort:** The design can be used efficiently and comfortably and with a minimum of fatigue
7 **Size and space for approach and use:** Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

Usability is seen as the catalyst for promoting inclusivity of UI's design. Many laws have been put in place to ensure that websites allow people with different capabilities to use without the need from others. Inclusive Design promotes maximising the number of potential users, by reducing the emphasis on aesthetics and more on accessibility (Keates et al., 2000). Newell and Gregor (2002) argue that the idea of designing something for everyone to use can be discouraging to designers as it limits their freedom and caps the UI's capacities in terms of interaction and appearance. The idea of designing a UI that can be used by users with different capabilities – physical or mental- is a very hard task, if not impossible. Especially since designing a UI for disabled or older users would make the usage more difficult for users without disabilities (Newell and Gregor, 2002). The issue with designers is that they often design for able-bodied users and neglect the needs of users with different capabilities due to their unawareness to these users' needs and how to accommodate them (Keates et al., 2000).

In recent years there has been a shift of focus by user interface designers when designing for marginalised groups, moving from designing exclusively for older and disabled people toward an Inclusive Design approach, where designers try to accommodate the needs of these groups in their original designs, thus targeting as many users as possible (Christopher Sze Chong Lim, 2010). This is triggered by governments pushing legislations that promote inclusive design practices for their services as well as the growing change in demographics around the world and especially in industrial societies as the 60+ age group is continuously increasing. These potential users' needs are not being well catered for with current design of e-services. Solely focusing on able-bodied users will hinder the governments and businesses prospects reaching out to as many customers as possible (Chu et al., 2012).

This is important to governments and businesses alike, for instance businesses might lose potential customers to competitors if their e-services are difficult for older or disabled users. While with governments they are mandated by legislations to provide accessible services to all their constituencies. Many laws have been put in place to ensure that websites allow people with different capabilities to use without the need from others. Acts like the USA's Telecommunications Act of 1996 that requires designs to be accessible and usable for people with disabilities, similar laws have been put in place in many countries around the world to promote the same notion (Abascal and Nicolle, 2005; Story et al., 1998). Being able to serve a wide range of customers online without having to call customer service for assistance is key to reduce operation costs and free staff to handle more complex tasks. The British Standards Institute (2005) defines inclusive design as: 'The design of mainstream products and/or services that are accessible to, and

usable by, as many people as reasonably possible ... without the need for special adaptation or specialised design.'

While recognising that satisfying the needs of all potential users is an impossible task to achieve, inclusive design promotes an appropriate design response to diversity in the population through:

- Developing a range of products to provide the best possible coverage of the population.
- Ensuring that each product has clear target users.
- Reducing the level of ability required to use each product, in order to improve the user experience for a broad range of customers.

## 3.3 Sensitivity to Users' Needs in Inclusive Design

The term User-sensitive Inclusive Design (USID) was coined by Newell and Gregor (2000) as they were trying to find a new design paradigm that combines the UCD and Inclusive Design approaches capitalising on the strengths of these design paradigms. According to them USID is more a feasible choice than Inclusive Design or UCD because it focuses on 'inclusivity' rather 'universality' as designing something to be used by all is an unattainable goal for the majority of designs. Also the use of 'sensitive' instead of 'centred' indicates that it is not possible to design something truly accessible by all users in a potential user group.

Sensitivity also applies to data elicitation techniques used to test and gather needed information for the design (Newell and Gregor, 2002). Older adults need to be approached with careful consideration, first of all the design team must understand the current situation and how this user group go by without the current

system if the system is created from scratch, or the how they use the old system if it is an update project. During information elicitation sessions the design team need to ensure that they do not make older users feel inferior, this is done by labelling some features as for 'seniors', 'elderly', or 'disabled'. This can result in resistance from users or the sample used to represent users. On the other hand, the design team need to take in consideration the possible sight and hearing impairments of this user group when conducting a questionnaire or an interview (Newell and Gregor, 2002). This notion of sensitivity stretches to the way the users are being treated during usability tests. Inclusive Design encourages designers to avoid labelling users involved in the design phase as 'subjects' and treating them as if they are in a laboratory experiment for usability testing, as this discourages any meaningful relationship between users and designers (Newell and Gregor, 2000). Designers need to focus their attention to maintain a sustainable relationship with users to create an effective dialog that can provide insights for designers as well as to users; to the designers it can provide insights to how users use the potential system, what they would like to see in the system, and what will actually drive them off from using it. For users it can actually show them how useful the system is and how easier it is from their older ways of doing tasks –electronic or otherwise-, and thus encourage them to use the final product.

Newell and Gregor (2002) argue that Inclusive Design should be a design philosophy and a state of mind rather than just mere design guidelines. However, this design philosophy can also result in design guidelines that can help designers to ensure that their design is inclusive of as many user groups as possible instead of 'one-size-fits-all' strategy. Inclusive Design is pragmatic approach to design instead of focusing on one user group like UCD or trying to target all user groups like a one-size-fits-all strategy in Universal Design.

Depending on the needs and uses of the system, the design team need to adopt the appropriate design strategy to design a successful system.

Sensitivity to users during design helps designers to be more appreciative of the diversity amongst users, by exposing them to potential needs of these users to be considered in the final product. As mentioned above Inclusive Design promotes inclusivity when it comes to use of the system or the UI, given that some older adults might have care takers who might also use the same system. Thus Inclusive Design encourages the design team to include them during the data elicitation phase. The Notion of dynamic diversity is an important pillar of Inclusive Design as the designs will not only cater to different users with different capabilities but also will effectivity respond do the same user day-today or even hour-to-hour changes in his/her abilities (Gregor et al., 2002; Newell et al., 2010).

The designers' inability to understand and sympathise people's ability can have negative effects that can lead to users being excluded and frustrated, this ultimately translate to losing out to competition that can better understand and provide usable e-services. In order to better appreciate population diversity, it is important to defy stereotyping people as "able-bodied" and "disabled".

## 3.4 Design Evaluation Tools

There are multiple tools used by interface designers to evaluate their design. While they are all beneficial for designers, they differ in the way and the stage at which they are used. All these evaluation tools help designers to be more aware of the requirements of a broader user group and be able to fulfil these requirements.

### 3.4.1 Guidelines

One of the great benefits of design guidelines is that it can be used at various stages of the design process. At the early stages it can help with defining the requirements of the new interface, it can also be used as an evaluation tool to check whether specific requirements have been met in the design (Zitkus et al., 2013). While there are many accessibility guidelines available for designers, it is evident that designers still struggle with providing an inclusive and accessible user interface due to lack of knowledge or sometimes interest (Abascal et al., 2004). Finding appropriate design guidelines is a hard task not to mention trying to interpret these guidelines into actual designs (Sutcliffe et al., 2006; Zitkus et al., 2013). Designers need to be aware that the use of these guidelines need to properly evaluated and treated as suggestions to good practices, and not as treated as recipe book (Carroll, 2000).

### 3.4.2 User Evaluation and Involvement

User involvement in design practices have always been encouraged and recommended to ensure that the design meets the users' requirements. This democratisation exercise enables users to evaluate the new design and ensure that their concerns or recommendations has been voiced properly, and that the design team recognise them in their new designs (Ogonowski et al., 2013). This user participation exercise need carefully consider the needs and characteristics of the potential users, thus understanding why they use the system and how users interact with it, as the nature of the user participation will be different depending on the users. For instance users who suffer from dementia require establishment of long-term relationship between designers and users (Lindsay et al., 2012). User evaluation of interfaces is time and resource consuming endeavour, designers need to make the most out of it while balancing

the users' needs and system's/organisation's needs (Scariot et al., 2012). Vines et al. (2013) argue that opening up the user participation to social media and online communities can help in diversifying the experience and benefit from a wider prospective rather than a narrow user sample.

Distributed participatory design (DPD) is a design philosophy that encourages an active participation of users and other stakeholders in system design. Distributed Participatory design enables understanding between different stakeholders by giving them the opportunity to actively engage in design sessions and voice their opinions. Online this form of design is visible in the way that some website encourages users to voice their opinions about the design of the website as well as provide feedback about features they would like to see in it. This in turn create a bonding relationship between the website and the user, translated in the users' belief that the people behind the website really care about what they had in mind. Thus strengthening the website's community. Moreover, this allows the website's designers to get valuable feedback at a fraction of the price compared with if they had to do it in a traditional usability testing setting. It also allows users to freely express their minds about the design completely anonymous, so that users do not feel shy about expressing their opinions about the state of the website therefor get more objective feedback. However, with the cover of anonymity comes challenges, and of these challenges is what is called "trolling" in which an internet user provide feedback just to make fun of the website. This can be seen a lot in some Amazon product's feedback. Here the designers has to go through the feedback gathered and systematically evaluate which feedback is worth doing or feasible.

### 3.4.3 Simulation Tools

Simulation tools can be either physical or digital tools used to reduce the evaluators' physical abilities to mimic some of the disabilities experienced by users, thus empathising and acknowledging the needs of users other than themselves (Cardoso and Clarkson, 2012). For example, the reduced mobility gloves simulate a reduction in the functional ability of the hands. The gloves use plastic strips to limit the strength and range of motion of the fingers and thumb. This will make handling small objects difficult therefore allow designers to understand aspects of the disability. Another example is impairment glasses that resemble a loss of the ability to see fine detail and small text. The effects represent the inability to achieve the correct focus, reduced sensitivity of retinal cells, and problems with internal parts of the eye becoming cloudy. These effects naturally happen with ageing and the majority of eye conditions, or not wearing the most appropriate corrective glasses. These simulation tools are used as way to overcome the high time and cost consumption of evaluation with real users. While they do reduce testers' motor and sight capabilities, they are still not able to replicate cognitive abilities of some cases (Hitchcock and Taylor, 2003). While there is a wide range of simulation tools available designers need to ensure that these tools are effective in demonstrating users' characteristics so they do not assume that they understood users' experience while in fact they did not, leading to improper design decisions (Cardoso and Clarkson, 2012).

### 3.4.4 Heuristics Evaluation

Usability Heuristics are rule of thumb that broadly address usability issues that needs to be thought of during the design and evaluation of systems, where experts inspect a system to check its compliance to the certain heuristics (Nielsen and Molich, 1990). Usability heuristics evaluation has been used widely due to its low

cost, simplicity, and effectiveness of the results. Especially since its applicability in various stages of the design allowing the designers to assess the design based on the same set of criteria thus creating common ground that allows experts from different background to collectively evaluate the system (Hwang and Salvendy, 2010; Welle Donker-Kuijer et al., 2010). There are two types of heuristics evolution, summative and formative evaluation. The former utilises metrics to assess the achievement of the system's goal, while the latter focuses on detecting usability problems in order to improve the usability performance of the system (Inostroza et al., 2016).

Heuristic evaluation is usability evaluation conducted by usability analysts where they evaluate the user interface and compare it to a set of recognised design heuristics, as they do so they document their observations and rank them in terms of severity and their effect on the overall interaction. The analysts can either be experts in HCI or even users and people with special interest with less experience in HCI.

This evaluation can be carried out at different stages in the development lifecycle, and has a lot of benefits to ensure the usability of the design. Some of these benefits are listed below:

- It is easy to conducted and fairly cheap way to acquire feedback about the design. This allows the designers to see where they can improve the design.
- The feedback generated from the evaluation is usually deemed as useful and valid. Thus encourages the designers to follow through with the recommended corrections.
- The evaluation is mainly focusing on negative issues the can restrict the user from fully benefiting from the interface. The evaluation does not focus on the good things in the interface.

While this method is very useful to identify design problems in interface and recommend ways to improve the design. But since the evaluation is carried out by usability experts it mainly focuses on design and functionality issues instead of the interaction between an actual user and the interface.

Timing is key for a successful heuristic evaluation. So the design team should decide when they expect to have the evaluation carried out so they are not rushed in the final stages. The evaluators should be given ample of time to get familiar with the interface and understand the main purpose of the interaction. This way they will be able to construct usage scenarios and set up the evaluation criteria on which the inference will be tested against. These criteria must be agreed upon by the designers and the evaluators so they do not clash during the discussion of the evaluation's results.

The expert and the designers should collectively come up with the usage scenario and the evaluation criteria, so they are able to cover all possible routes in which the user might interaction with the interface. Communication between the experts and the designers is important to explain why some problems vary in terms of severity, and more importantly how these problems can be resolved.

After the evaluation is completed a report is produced to highlight a comprehensive list of the problems identified in the interface, accompanied by the severity ranking of these problems. This will allow the design team along with the experts to prioritise which problem should be covered first. In general, all usability problems should be resolved, however if the design team does not feel that this problem is severe enough they can choose to defer it to further design iteration or simply ignore it. Of course the discussing

the ramification of the problem with the experts is very important to make that decision.

### 3.4.5 Comparison between Evaluation Tools

**Table 3 - Comparison between Usability Evaluation Tools**

| | **Definition** | **Advantages** | **Disadvantages** |
|---|---|---|---|
| **Guidelines** | Are a set of rules to build an inclusive website or e-services created by a governing body like W3C. | • Unified set of requirements to follow<br>• Inexpensive<br>• Reusable | • Open for interpretation<br>• Rigid |
| **User involvement** | Incorporating the users during the design sessions, and making sure that their voices are heard and that designs are suitable to them | • Builds trust<br>• Identify problems not known to the designers<br>• Good to avoid or minimise disagreements | • Expensive<br>• Requires a lot of time and management<br>• Does not always translate to satisfaction |
| **Simulation tools** | Using special tools and software to | • Relatively cheap | • Not very accurate |

| | | | |
|---|---|---|---|
| | mimic how a person with disability would interacting with the website or e-service to allow designers to understand the nature of the disability | • Builds sympathy among designers<br>• Facilitate smoother testing for interfaces | • Cannot provide wide range of abilities<br>• Can be affected by designers' bias |
| **Heuristics Evaluation** | General rule of thumb that promotes and ensures that the usability of a certain website or e-service is within an acceptable level | • Flexible<br>• Inexpensive<br>• Can be used by experts and non-experts | • Open for interpretations |

## 3.5 The Inclusivity Metric

The Inclusivity Metric proposed in this research aims at extending the Inclusive Design principles of Architecture to the field of HCI. While in the Architecture Field Inclusive Design translates into

incorporating ramps alongside of stairs and wide doors. Inclusive Design applies to HCI in terms of ensuring that the interaction with the interface provides the same level of information –and enjoyment- to users with different skill sets (Story et al., 1998).

The Inclusivity Metric is an electronic survey that asks the user questions regarding the constructs mentioned in the previous section, to measure how the user believes that the e-service was able to satisfy these constructs. This is done directly after the user has finished their interaction with the e-service, the interaction is still fresh in his/her mind. To improve results further, it is recommended that e-service remains active so the user can observe the e-service further to ensure that s/he remembers the interaction.

The user has to answer all the questions in the Inclusivity Metric, except for the Flesch-Kincaid Reading Ease test which will be done automatically by the Metric. This is done by taking a URL of the e-service and submitting it to a website that calculates the ease of use of this page. Using the same formula used before to calculate the reading level required for the page (See section 6.2.2.1). The readability test generates a result on a 100 scale, this will be changed to a 5 scale to go with the results of the rest of the questions in the Metric.

After all the answers are supplied by the user, the answers are averaged to create a sub result for each construct. This will allow the design team to see where are the areas that needs improvement and the areas that helped the e-service to score highly. The equation to calculate the Inclusivity Sub-score for each construct is as followed:

$$ISS = \frac{1}{n}\sum_{i=1}^{n} a_i$$

Finally, the sub results are averaged together to generate the Inclusivity Score that corresponds with the inclusivity levels (See section 6.2.1 Inclusivity Levels). The equation to calculate the Inclusivity Sco re is as followed:

$$IS = \frac{1}{N}\sum_{j=1}^{N} ISS_j$$

The metric is transformed into a Google's form where all the data will be accumulated in a spreadsheet, which will in the end will perform the calculation to reveal the Inclusivity Score. To simplify the use of the Inclusivity Metric, in this research all the constructs were given the same weight. However, this can be changed based on the context of the study and whether a certain construct is valued more than the others.

### 3.5.1 Inclusivity Levels

The Metric proposed in this research can be tailored to the needs of the system to be developed to properly address inclusivity requirements. The design team or the interface evaluators can assign scores based on the criteria that they can assign for each constructs (See Appendix 2). After rating each element of the construct on 5-level scale, the result is then averaged to produce the Inclusivity Score that determines how inclusive the interface is (Table 4). This can help designers as well as other project's stakeholders to visually assess how inclusive the interface is and ensure the maximum usability of the system.

**Table 4 - Inclusivity score's breakdown**

| Inclusivity Score | Inclusivity Level | Comments |
|---|---|---|
| 4 to 5 | Very High | In line with all inclusivity standards |
| 3 to 3.99 | High | In line with all inclusivity standards, with opportunities to improve |

| | | |
|---|---|---|
| 2 to 2.99 | Medium | Barley in line with inclusivity standards |
| 1 to 1.99 | Low | Requires work to be in line with inclusivity standards |
| 0 to 0.99 | Very low | Requires a lot of work to be in line with inclusivity standards |

### 3.5.2 Inclusivity Constructs

To further tailor the Inclusive Design principles to HCI, and bridging it with the usability principles discussed in Section 2.5.2 Main Usability . The constructs that constitute the Inclusivity Metric are as follows:

1. **Readability:** The terms used in the interface are easy to understand and does not require field knowledge.
2. **Affordance:** The interface provides visual and audio clues that inform the users how to interact with the objects.
3. **Error Tolerance:** The interface prevents users from making errors and if so the errors are clearly worded.
4. **Organisation and Colour Coordination:** The interface has enough colour contrast and the information is clearly organised in small chunks.
5. **Natural flow of information:** The interface mimics normal conversation.
6. **Vigilance to users' abilities:** The interface has all the assessable features that enable any person with disability to use it without asking for help.

This section outlines the constructs of the Inclusivity Metric in details. Showing how they emerged and more importantly how they the inclusivity of a user interface to allow older adults as well as other marginalised groups to use ICT easily.

#### *3.5.2.1 Readability*

One of the issues that come with ageing the decline of vision, thus having the appropriate font size for text used in the user interface is very important to ensure that it can be read and understood by users. Moreover, refraining from using complicated terminologies can also improve readability of the user interface. One of the important benefits of online services is that users have the freedom and flexibility to use the service without the need to rely on customer support or others to understand the terms used. Nielsen (1994b) said that "The system should speak the users' language", this means that the terms used in the interface matches the terms that the users use in their everyday life. In order to ensure this match of understanding Flesch-Kincaid Reading Ease test can be used to evaluate the readability of the text (Friedman and Hoffman-Goetz, 2006). Flesch-Kincaid Reading Ease Score (FRES) gives a score of 100, where 100 is the highest readability score and 0 is the lowest. The score can later be changed to a 5 scale to ensure constancy of the Inclusivity Score by dividing the result of the test over 20 this way all the results of each construct of the Metric are on 5 scale. For example, if the FRES gave a score of 72, that would result in a score of 3.6 in the Inclusivity Metric. Many studies have shown that FRES is very reliable to compute the readability score and it has been coined as an industry standard to measure readability (Cotugna et al., 2005; Friedman and Hoffman-Goetz, 2006; Grossman et al., 1994). More importantly, FRES can be easily automatized this would reduce the work on the evaluator to calculate the readability score (Paasche-Orlow et al., 2003) . Improving the readability score can be done by using alternative words with less syllables, and choosing fewer words in a sentence. Table 5 shows a breakdown of the score and by whom this test is easy to read. In the Flesch reading-ease test, the formula for the Flesch reading-ease score test is:

$$206.835 - 1.015\left(\frac{total\ words}{total\ sentences}\right) - 84.6\left(\frac{total\ sylabes}{total\ words}\right)$$

Luckily there are many websites that can do this calculation without having to go word by word and calculate the result. For this research, a website called https://readability-score.com/ was used. This website calculates the readability score just by uploading a document or a URL.

**Table 5 - Flesch reading-ease score breakdown**

| Score | Education Level |
|---|---|
| 90.0–100.0 | Can be read by a student in 5th grade |
| 80.0–90.0 | Can be read by a student in 6th grade |
| 70.0–80.0 | Can be read by a student in 7th grade |
| 60.0–70.0 | Can be read by a student in 8th & 9th grade |
| 50.0–60.0 | Can be read by a student in 10th to 12th grade |
| 30.0–50.0 | Can be read by a student in college |
| 0.0–30.0 | Can be read by a college graduate |

#### *3.5.2.2 Affordance*

Norman (2005) talks about the notion of affordance in design for the everyday items people use. This notion also applies to HCI, in which visual clues should be given to the users to inform them about the required steps to accomplish a given task without having to read the instructions. Clues like the trash bin metaphor used in operating systems to inform users they can use it if the wan t to delete and item. These metaphors and clues should be used with great amount of consideration as they have to culturally familiar, an example of that is the use of floppy disk icon to save items, floppy disks have obsoleted for a more than a decade however they are still used for the same purpose in current user interface. For younger users it does

not relate to any experiences they previously had with saving files in a disk. According Gaver (1991) affordances can be categorised into three types: perceptible, hidden, and false.

- False affordance: where an obvious affordance does not have any real function, that the person does not recognise any possibilities for action. For example, a placebo button is a false affordance.
- Hidden affordance: where there are possibilities for action, but are not apparent to the user. For example, it is not apparent from looking at a paperclip that it could be used to make charging wires stick on the edge of a table.
- Perceptible affordance, where there are obvious signs and information that the person to know how a thing works and can then perform the action.

Therefore, when affordances are hidden or false, they can lead to mistakes and misunderstandings. On the other hand, perceptible affordance offers a straight connection between perception and action. Physical affordances are very important to allow people to understand and use items in the physical world. In graphical design however, physical affordances are not as important, thus other principles are adopted.

#### *3.5.2.3 Error Tolerance*

Making errors and mistakes is inevitable, so the role of the user interface is to first minimise the opportunities for errors, then guide users to the right course of action if an error is committed. User interface should provide the appropriate validation and control mechanisms to spot errors as they happen to avoid feeding the system with erroneous data and reduce the time required by users to interact with the user interface. Clear labelling of what needs to be

inserted in the text box showing that the users need to input numerical or alphabetical data. Furthermore, guidance should be given to users if they need to know what should be used as an input for the user interface. The interface should be able to do the following:

- Make it hard to commit mistakes. This can be done by making the links and other interaction elements distinguishable, ensuring that all related elements are grouped together, and using plain language and avoid all technical terms.
- Make it hard to commit invalid actions. This can be done by providing clear examples for acceptable data for the specified field, limiting choices to only few valid options if using radio buttons or check boxes, and only suitable navigation choices.
- Make it hard to take permanent actions. This can be done by providing the ability to back to undo actions, and avoiding dead-end screens that does tell the users whether their actions were correct or if they have completed the process.
- Plan for the unexpected. This can be done by allowing users to add new entries, especially since the designer cannot predict everything. This will also give the user a peace of mind as they will be able to express themselves like they are speaking to a person. More importantly.

#### *3.5.2.4 Organisation and Colour Coordination*

Organisation of the elements in the user interface is a very important feature to ensure the success of any user interface. Organisations and the use of clear borders can help users to understand what needs to be inserted in a given field and ensures that the information is logically organised to ensure full understanding of the content. On the other hand, colour coordination is a two edged sword. While colour can enhance logical organisation

of user interfaces and overall appearance, they can defeat the purpose if they are used extensively. Careful consideration must be taken to ensure that people who suffer from colour blindness can use the user interface comfortably. So clues other than colour should be used to convey certain information. Nielsen (1994b) encourages the use of minimal design by which designers reduce the use of graphics in their designs while maintaining an appealing look of the interface.

#### *3.5.2.5 Natural Flow of Information*

The interaction with the user interface should provide seamless and logical flow of information and steps to accomplish a certain task. Clearly showing the required steps to fulfil the users' needs and mimicking the way the users are interacting with a service in person or over any medium of communication. This ensures that users understand what is needed from them and what they except to receive at the end of the interaction. The notion of metaphor also applies broadly here, in which the entire interaction with the user interface resembles the interaction that the users would except if they done the task in real life. Clearly showing where the user is, how many steps needed, and what the steps in the task are very important step to enhance logical flow of the interaction. Nielsen (1994b) discussed it in his usability heuristics by encouraging designers to reduce the cognitive load from users by recognition rather than recalling.

Cognitive load cannot be removed completely, especially since the main reason why people go to websites is to get information about a certain issue. There are two types of cognitive loads Intrinsic and Extraneous. Intrinsic cognitive load is the effort to understand new information within the scope of their objective. On the other hand, the designers should aim to minimise extraneous cognitive

load which is using mental resources, but does not contribute to learning or understanding the information provided.

#### *3.5.2.6 Vigilance to Users' Abilities*

This is done by ensuring that the user interface can be used by people with disabilities, the user interface should conform to the accessibility regulations issued by governments or public guidelines such as W3C accessibility guidelines. User interface compatibility to screen readers to allow users is vital to ensure usability by users with sight disabilities. Moreover, options to eliminate colour from the user interface is also useful to for users with colour blindness. Designers should be aware that users do not necessarily use the system in similar way that they do, below is a list of things to be considerate of:

- They may have visual, hearing, mobility issues that prevents them from interacting with the interface
- They may have comprehension issues that prevents them from processing some or all the information provided.
- They may have different version or the browser or operating system.
- They may have different computers, or different screen size that the designer.
- They may not speak or understand the language used in the interface.
- They may not familiar with to using a keyboard or mouse.
- They may be in a different operation environment, like outdoors

Moreover, W3C (1999) has specifies a 3-level priority checklist for the bare minimum accessibility requirements that span from absolutely necessary to optional features. For this research Priority 1

checklist is required where the interaction will be impossible without the integration of these features (See Appendix 3). These three priority checklists are:

- Priority 1: The designer **must** satisfy these requirements. Or else, one or more groups will find it impossible to access information in the website. A satisfying these requirements is mandatory for some groups to be able to use web documents.
- Priority 2: The designer **should** satisfy these requirements. Or else, one or more groups will find it difficult to access information in the website. As satisfying these requirements will remove significant barriers to accessing web documents.
- Priority 3: The designer **may** address these requirements. Or else, one or more groups will find it somewhat difficult to access information in the website. As satisfying these requirements will improve access to web documents.

(W3C, 1999)

## 3.6 Summary

This chapter introduced the main topics about Inclusive Design by first distinguishing between Inclusive Design and User-centred Design. Highlighting the philosophical differences between these two strategies as well as the overall similarities. Furthermore, this chapter also pinpointed the importance of the sensitivity to users' needs upon adopting Inclusive Design strategy. Finally, the chaptered presented various tools to evaluate the effectiveness of design and its usability.

# Chapter 4: Research Methodology

## 4.1 Introduction

This chapter is focused on the research methodology. First, it discusses the philosophical worldview of the research. This is important to demonstrate the researcher's assumption about the reality and how knowledge is extracted and analysed. Then, the design of this research is discussed showing how the research design fit the purpose of the study. After that, the methods used in this research are outlined, to show how data were collected for the study purposes. Also the data collection process is discussed to show how and when data were collected. Then, the data analysis technique is discussed to show how data were systematically analysed to discover the themes in the empirical chapters. Also, information about the context of the research is discussed to provide an idea of the scope of the research. Finally, reflexivity is discussed to demonstrate how the researcher improved the rigor of the study.

## 4.2 Philosophical worldviews

This research adopted a pragmatic methodology, this methodology favours utilising quantitative and qualitative research methods. Pragmatism tries to bridge the gap between conflicting research paradigms (positivism vs. interpretivism), demonstrating the value to combining those paradigms. Pragmatism does not encourage epistemological extremism, as it promotes to use the research method 'appropriate' to answer the research questions; giving the researcher more freedom to utilise the optimum research methods from different paradigms without compromising their epistemological assumptions. As the notion of incompatibility between the two pure paradigms has been discredited by researchers (Morgan, 2007).

In terms of inductive and deductive approach to theory, pragmatism provides a middle ground between the data to theory and theory testing with an abductive approach. Induction focuses on data to infer theory from the recorded observations which relates to qualitative research, and deduction focuses on theory testing which relates to quantitative research; abduction moves in between theory testing and theory generation (Johnson and Onwuegbuzie, 2004). Pragmatism allows researchers to evaluate result from induction efforts to test its ability to predict behaviours in different settings (Morgan, 2007). This approach is well suited for the proposed research questions as this research aims at improving inclusive design methodologies to in order to allow older adults to fully benefit from current technologies using notions and theories in the literature review that tried to address the digital divide.

When it comes to the researcher position with the research in hand; Pragmatism favours an intersubjective view of the world. In reality, it is really difficult to assume a pure objective ontology as positivism promotes or a pure subjective ontology as interpretivism promotes (Ormerod, 2006). Intersubjectivity allows researcher to assume a single reality with different interpretations of that reality by individuals in that world, allowing the researcher to move back and forth from subjectivity to objectivity (Morgan, 2007). This notion is especially important for action researchers as they are fully immersed in the field as they try collectively with the research participants to introduce change in the research context.

Moreover, the divide between contextuality and generalisability is not favoured in pragmatism. Demonstrating that research results are genrelisable is the backbone of any positivist research. However, ignoring the unique characteristics of each settings and purely aiming for genrelisable results, can affect the contribution of the research.

On the other hand, highly focusing on context may result in a very narrow research contribution (Goldkuhl, 2012). Pragmatism promotes transferability, as it helps researchers to utilise the unique characteristics of a specific context and try to learn what are they key findings that can be transferred to other contexts (Morgan, 2007). This is highly useful for the study of cognitive age and technology adoption among older adults, as the results depend on the context so deeper understanding of the context is needed, and they need to be generalisable and easily transferable to any context.

## 4.3 Research Design

The study took the form of an Action Research, as the researcher was heavily involved in the development of e-services to ensure that these services are usable by all users including older adults. The involvement of the researcher is vital in any Action Research, as this involvement differentiates Action Research from any other research design. More importantly the ownership of the research is shared amongst the researcher and the research 'subjects', thus changing the dynamic of the relationship and shift their role from a research subject to a research partner/participant (Kemmis and McTaggart, 2005). Byrne (2005) argues that Action Research is crucial to bridge the gap between practice and theory in the field of IS. Especially since IS research is an applied field where researchers usually try to solve a problem using their knowledge and expertise (Baskerville and Wood-Harper, 1998).

Action research is "learning by doing" where a group of people -researcher and research participants- discover a problem in a specific field, come up with a solution to solve the problem, evaluate their success and if there is more room for improvement, try again. What makes Action research more unique than day-to-day problem solving is the focus on scientific study, where a researcher

systematically explores the problem guided and informed by theoretical considerations. The researcher collects, analyses, and discusses the findings on an ongoing, recursive manner. As outlined in the quote from Gilmore et al. (1986):

> "Action research...aims to contribute both to the practical concerns of people in an immediate problematic situation and to further the goals of social science simultaneously. Thus, there is a dual commitment in Action Research to study a system and concurrently to collaborate with members of the system in changing it in what is together regarded as a desirable direction. Accomplishing this twin goal requires the active collaboration of researcher and client, and thus it stresses the importance of co-learning as a primary aspect of the research process."

Action research is often confused by case studies. However, Action Research distinguishes itself from other research design by its focus on engaging the research participants and encourage them to become researchers themselves, because when people learn things by themselves they are more likely to apply and stick to what they learned during the research process. Moreover, what makes Action research more unique is that the research is conducted in real-world, and aims to solve real problems. Finally, the researcher does not aim for objectivity however; s/he openly acknowledges their bias to the other research participants.

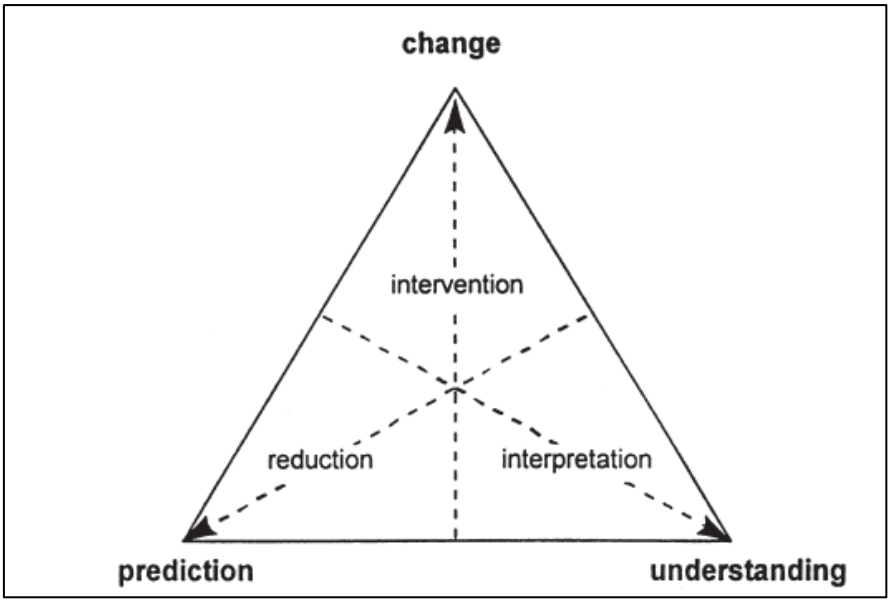



**Figure 7 – Research paradgims in IS**

**Source: (Braa and Vidgen, 1999)**

The Figure 7 shown above shows the different tensions in IS research. With positivist approaches lean towards reduction of the research problem to cause and effect relationship that can highlight the factors effecting an issue in order to predict future behaviour. This type of research is very popular in IS literature, as it helps to 'reduce' the problem into smaller subset of factors and treat the problem in isolation to be able to predict it. As with most positivist research the need to reduce researcher's bias and involvement is very important to the validity and reliability of the research findings, this is reflecting in the research methods used such as questionnaires and experiments that reduces the researcher's role in the study. Reliability in Positivist research ensures that if the research is conducted many times the results will somehow be the same thus ensuring that the constructs used in this research are good at predicting the research problem. On the other end of the spectrum is the interpretive approach that favours understanding the research problem rather than predicting courses of action and relaying on casual relationships.

With interpretive approach the researcher tries to develop deeper understanding of the research problem and produce rich description of the issue at hand. Not only that, interpretive approaches are very useful to generate theories rather than just testing them as in the case of positivist approaches. Intervention approaches like Action Research are app roaches that rely on changing the current state of affairs in certain research setting, whether by following certain theories to overcome a particular problem or by theorising certain aspects of the problem. Change here is the ultimate goal of the research and thus has more impact on societies compared with the mentioned research approaches (Braa and Vidgen, 1999). Action research within this definition sits between interpretive and intervention research approaches in a way that encourages researcher to introduce a change in the research area but also try to interpret and understand the issue at hand.

Case studies let researchers dig deeper in a particular phenomenon or situation rather than sweeping statistical survey. Thus allow researcher to narrow down a board research field into smaller manageable topics (Yin, 2013). Drawing the boundary of the case study can be a difficult task for researchers as research problems have many inter-related connections with each other, which forces researcher to put careful consideration of defining and justifying case studies boundaries (Baxter and Jack, 2008). While case studies are categorically considered to be inclined towards qualitative/interpretive research, they nevertheless give the researcher more freedom to select the appropriate research methods that best fit the research questions whether qualitative or quantitative methods, which feeds into the pragmatist research methodology. Case studies are not usually used to generalise findings to other settings but rather provide indications and allow further

elaboration and hypothesis creation, due to the smaller subset of society the researcher is interested in. Similarly, Wood-Harper et al. (1985) Multiview type of Action Research resembles case studies in the way it allows the application of multiple research methods. This way researcher are not restricted in the boundaries of the false dichotomy of qualitative or quantitative research.

For this study, Action Research was deemed fit to answer the research questions because the problem was to first identify the elements that hinder a true application of Inclusive Design, and then create a solution that in turn would bridge the age-based digital divide. Ethnography is very useful to identify the hidden problems within the research context and develop deeper understanding of the issues faced by the research participants as it allows the researcher to be immersed into the field (Myers, 1997). However, like all interpretive research designs they lack the ability to bring change into the research context. Action research however, provide a platform to first utilise ethnographic and even quantitative methods to investigate the hidden problems that affects the research context. In this research, ethnographic methods like interviews and observations were used to provide deeper understanding of the problem and allow the researcher to be immersed and work hand in hand with the researcher participants to develop and evaluate an inclusive e-service.

Case studies also were considered before choosing Action Research. However, case studies did not fit with the research goal to develop an inclusive e-service, because just like ethnography it was mainly focused on a specific field to provide a comprehensive picture of the issues that are interweaved in the context (Yin, 2013). In addition, quantitative methods like questionnaires were also considered. However, they do not fit with the research, as the

researcher has to distance him/herself from the research context so s/he does not bring in bias that would affect the research objectivity and reliability. With Action Research, the researcher's main goal is to study that change done by his presence and involvement with the research participants while trying to solve the research problem. In this Action Research some elements of Grounded Theory in the way that the knowledge is created through the analysis of data and that the researcher allows the data to tell the story instead of going into the field with specific framework (Suddaby, 2006). This research utilised a combination of research methods ranging from interviews, observations and experiments. As Action Research allows the usage of multiple methods answer research questions.

Action Research comes in many flavours that differ from one another in terms of how they apply action to resolve a problem in the field. Nonetheless, they all have intervention in common (Baskerville and Wood-Harper, 2016). Baskerville and Wood-Harper (1998) have categorised these various types of Action Research in terms of process model, structure, involvement, and primary goals.

In terms of process model, Baskerville and Wood-Harper (1998) categorised these Action Research forms as iterative, reflective, and linear. Iterative Action Research uses iteration until the research problem is resolved; an example to this form is Canonical Action Research (Baskerville, 1993). Reflective Action Research where the focus is on the researcher and the research participants unearthing of how certain things are unexplained in their own thinking; an example to this form is Action science (Argyris et al., 1985). Linear Action research on the other hand, implies that the research progress from start to finish in sequential way rather than cyclic way; an example to this form is Multiview (Wood-Harper et al., 1985).

Moving to different structures in Action Research, Baskerville and Wood-Harper (1998) categorised these Action Research forms as either rigorous, or fluid. Where Rigorous Action Research were detailed, steps have to be taken in each step or cycle based on a set of rules; like Multiview (Wood-Harper et al., 1985). On the other hand, Fluid Action Research does not define each step thoroughly but leaves activities to happen in an organic way allowing more freedom to explore and resolve the research problem; an example to this form would be Action Learning (Naur, 1983).

In terms of process model, Baskerville and Wood-Harper (1998) categorised these Action Research forms as collaborative, facilitative. Collaborative involvement implies that the researcher and the research participants are in equal footing and that tasks are shared amongst them equally to resolve the problem; an example to this form is Canonical Action Research (Baskerville, 1993). Facilitate involvement identifies the research as the expert and the transfer the responsibility to resolve the problem to the research participants; an example to this form is Action science (Argyris et al., 1985).

Finally, Baskerville and Wood-Harper (1998) categorised Action Research goals as organisational development, system design, scientific knowledge, and training. With organisational development as a primary goal, the research aims to improve the organisation in terms of social conditions like communication and morale; an example of this form would be Action science (Argyris et al., 1985). While with system design, the aim is to develop or upgrade a system that would have impact on the organisation's efficiency and effectiveness; like Multiview (Wood-Harper et al., 1985). Scientific knowledge aims to contribute to the literature from the findings of the research problems. Training aims to individual and group learning

to improve understanding of a certain issue; an example to this form would be Action Learning (Naur, 1983).

This research does not fit exactly in these classifications as it shares certain element with each form of Action Research. However, it has more similarity with Action Learning where the main goal is to develop deeper understanding of the problem in the research context allowing the researcher and the research participants to create a solution to the problem collectively. The Action Research form chosen for this study can be seen as reflective in terms of research process, fluid in terms of structure, collaborative in terms of researcher involvement, and in terms of goals mixed between system design and training.

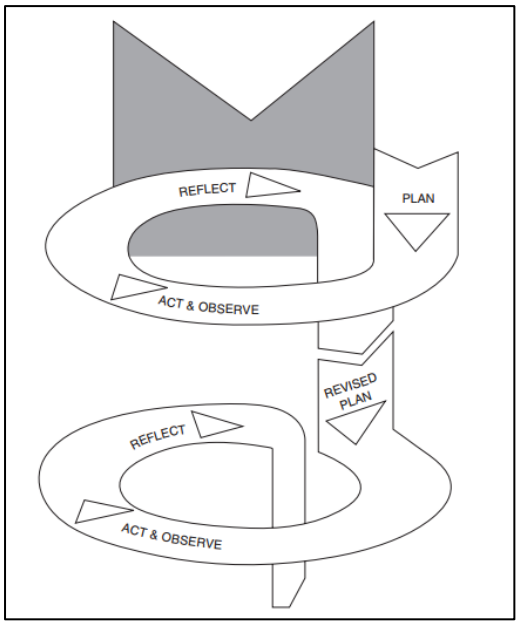



**Figure 8 – Action Reseach cyclic process**

**Source: Kemmis et al., 2013**

As shown in Figure 8, Action Research in its basic form is an iterative process that moves from planning to implementing the plan and then evaluating the results (Kemmis et al., 2013). Throughout

this cyclic process the researchers has to be reflexive and be aware of their own judgments, because only with constant challenging and comparison of one's assumptions and judgments, new opportunities for learning will emerge (Coghlan and Brannick, 2014). Action research allows researcher to actively introduce change in a research setting and thus contributing to the body of knowledge as well as impact the industry or society the research is located at.

## 4.4 Research Methods

The research was carried out in a Local Council in the UK, amid a change in the way that County/City Councils offer social care services to their constituencies, following the introduction on the Care Act 2014 around the UK, which encourages County/City Councils to engage with their customers electronically to request or update their social care needs and services. As for Action research, the researcher did not just observe the interaction in the e-service's design sessions, but was actively engaged with the research participants amid the design sessions asking questions and proposing solutions as the design team progressed in the creation of the service. During these weekly design sessions, interviews were conducted with participants of the design sessions who range from ICT professionals, marketing personnel, social workers, and customer service representatives. Along with observing these design sessions the Inclusivity Metric was used to evaluate the inclusivity of the designs. The interviews helped to define the project context and to further understand the participants' backgrounds and their involvement in the project. At the end of the design session the Inclusivity Metric was used to evaluate the website design and then further discussions were facilitated by the researcher with the research participants to provide feedback on the design and on the Metric itself.

The full-day design sessions were carried out on a weekly basis. During the early ones the researcher sat through the sessions to understand the design strategy followed in the Local Council, which helped to establish deeper understanding of the underlying processes that needs to be in check during the design and help found trust between the participants and the researcher. These observations shed the light on important issues to be addressed during the design on inclusive websites, like the discussion around the use of certain terms to convey information and the procedure flow for users and social workers. At the end of the design sessions the Inclusivity Metric was used and the results were discussed among the design team, to demonstrate where they needed to improve and also feedback on the Inclusivity Metric itself. The data collected then were transcribed and thematically coded using NVivo 11.

A mixed method strategy was followed in this study as the research was be conducted in local council in the UK. The research utilised different research methods simultaneously, this serves as a mean of triangulating the results and improve the understanding of the situation and come up with the required improvements.

### 4.4.1 Interviews

Semi-structured interviews were carried out before and after the implementation of the Care Act 2014, these interviews targeted various individuals involved in this implementation. First, interviews were conducted with the Care Act team in the Local Council, these interviews provided insights on the current affairs in the Local Council in terms of social care services, looking at the way Local Council has been offering these services and how they are interacting with external entities like Clinical Commissioning Groups (CCGs), and private care providers. These interviews also helped in understanding the motive for the introduction of the Care Act and the proposed

change in social care services delivery. Moreover, interviews were conducted with social workers to understand their current state of affairs and what can be done to improve their services delivery. The Care Act system design team was also interviewed to see how they are planning to create these required services that pass through the traditional organisational boundaries to provide a seamless interaction with users. Below is a list of research participants interviewed for the purpose of the study. Table 6 shows the participants and their respective specialty along with code to ensure the anonymity of the participants.

**Table 6 - Participants' specialties and interview length**

| Number of participants | Participants' Field | Length of the interview |
|---|---|---|
| 2 | Web Developer | WD1: 45 minutes<br>WD2: 30 minutes |
| 1 | Project Manager | PM: 60 minutes |
| 3 | Social Worker | SW1, SW2, SW3 Group Interview: 60 minutes |
| 2 | System Analyst | SA1: 30 minutes<br>SA2: 40 minutes |
| 2 | User Interface Designer | UID1: 30 minutes<br>UID2: 60 minutes |
| 3 | Care Act Consultant | CAC1: 60 minutes<br>CAC2: 90 minutes<br>CAC3: 30 minutes |
| 1 | Digital Team Manager | DTM: 60 minutes |
| 1 | Member from Senior Management | SM: 30 minutes |

The interviews covered a range of questions that shed the light on how the Local Council was able to embed inclusive design practices in their projects, how the project team manages the challenges that stem from inclusive designs efforts, and whether these challenges can be overcame and design issues be highlighted with the Inclusivity Metric.

On the other hand, interviews were conducted with older adults to get a deeper understanding of what drives them off from using online services and how they want the interaction to look like, these interviews served as vignettes of the to grasp the issues that older adults have while interacting with computers and online services. Collaborating with libraries in the research location an invitation was sent to older adults who visit those libraries for the computer training sessions –Try IT-. The invitation first asks them to participate in the testing sessions, and then share their experience with the researcher in a semi-structured group interview. This can help to shed the light on the issues that older adults struggle with from the older adults' point of views well as other users from different age groups. The group interview span around 2 hours after the testing sessions. Moreover, another 2-hour group interview with younger research participants was carried out after their testing session with the Inclusivity Metric. Table 7 shows the details for the group interviews conducted after the testing session using the Inclusivity Metric.

**Table 7 - Post testing group interview breakdown**

| Research Participants | Number of participants | Duration | Age group | Code names |
|---|---|---|---|---|
| Students | 10 | 2 Hours | 18-20 | S1-S10 |

| | | | | |
|---|---|---|---|---|
| Design Team | 9 | 2 Hours | 25-40 | WD1, WD2, PM, SW1, SW2, SW3, UID1, UID2, DTM |
| Older Adults | 9 | 2 Hours | 60 and above | O1-O9 |

### 4.4.2 Observations

It is very important to see how older adults interact with computers, so a better understanding of the things that make the interaction easier or harder can be highlighted. Thus, observation was conducted as part of the data collection process to discover more from what have been stated in the interviews as well as the literature. Table 8 breaks down the number of observation sessions and participants of these observations. In total, 24 observation sessions were carried out accumulating 77-hour worth of observation data span roughly through the second year of the PhD program.

**Table 8 - Observations Breakdown**

| Number of Observation Sessions | Duration in total | Location | Research Participants | Note |
|---|---|---|---|---|
| 5 | 5 Hours | Computer Lab | Older adults | Computer training sessions |
| 19 | 72 Hours | Local Council | Design Team | Design Sessions |

Part of the observations were carried out during the computer training sessions conducted by the library staff with the help of a local charity. This help to identify areas of difficulties during the interaction with computers and report that to Local Council while designing the online forms for the Care Act Moreover, observations were conducted during the design task forces carried out in the Local Council to design the online forms for the Care Act. This helped to shed the light on the design process and how things are prioritised during the design phase. The Local Council is following task force design strategy that encourages people from different departments to interact with one another in place one day a week, to discuss the design needs and the user needs as well as the organisation regulations and requirements.

The researcher did not hold the role of a passive observer during the data collection process but was an active observer. Interacting with older adults during the training sessions and asking them about their interaction with computers, to make sure that there is no important data missed during the observation or make sure that the researcher interoperations are valid. On the other hand, this active observer role is important during the design task force as well. Highlighting and communicating the needs of older adults captured from the interviews, the observations, as well as the literature, to ensure that the online forms provide a seamless interaction for users regardless of their age, capabilities, computer skills.

### 4.4.3 Experiments

The experiments used to test the design of the online forms based on the Inclusivity Metric developed in this research. The experiments were be conducted in the computer labs with different users, testing the online forms based on the constructs of the Inclusivity Metric (see Appendix 2: Inclusivity Metric). These

experiments served as a user testing exercise for the Local Council to ensure usability of the final online forms and to gather feedback to improve the design in further design iterations. Moreover, these experiments served as mean to validate the Inclusivity Metric proposed in the research. All the participants were not paid and volunteered after seeing an ad in the University campus, they all were asked to sign a consent to participate in the usability testing (See Appendix 1).

The experiments first evaluated the Council's e-service with the Design Team based on the Inclusivity Metric. Then, the same participants evaluated another online form that scored highly in the Inclusivity Metric. This helps to see where the current design of the Care Act online forms sits in comparison with the mentioned online forms. The participants were given tasks to perform on each online form. After finishing tasks from each form they were given survey to evaluate the online forms based on the constructs of the Inclusivity Metric. Finally, they are interviewed as group to get their feedback on the interaction as well as understand what hinders their technology use.

The research required 30 participants to evaluate the forms. However, only 28 participants were able to finish the entire experiment as one from each group had to leave the experiment early so their data was discarded from the results. These participants were selected from three different age groups to test the inclusivity of the online forms outlined in Table 9.

Table 9 - Usability Experiment participants' classification

| Minimum number of participants needed | Age range | Reason |
|---|---|---|
| 10 | 18-20 | Have high computer skills |
| 9 | 25-40 | Have high computer skills |
| 9 | 60 and above | Have low computer skills |

These experiments allowed the researcher as well as the design team a window to how real users interacted with the online forms, and where they struggle to propose new courses of action if possible along with set of recommendations for future designs. The experiments were conducted as followed; first, the younger research participants evaluated the Insurance Company e-service. After all their scores were evaluated and tabulated, the older research participants also evaluated the Insurance Company's e-service. Finally, the Design Team evaluated their own e-service as well as the insurance company's e-service to see the difference between the approaches to inclusive design. It is important to note that only the design team were able to evaluate the Council's e-service, due to concerns of privacy and time constraints. Therefore, it was decided that the other research participants would evaluate the insurance company's e-service only in order to understand what are the features that improves inclusivity. Figure 9 below show the research particpants and the e-services they evaluated.

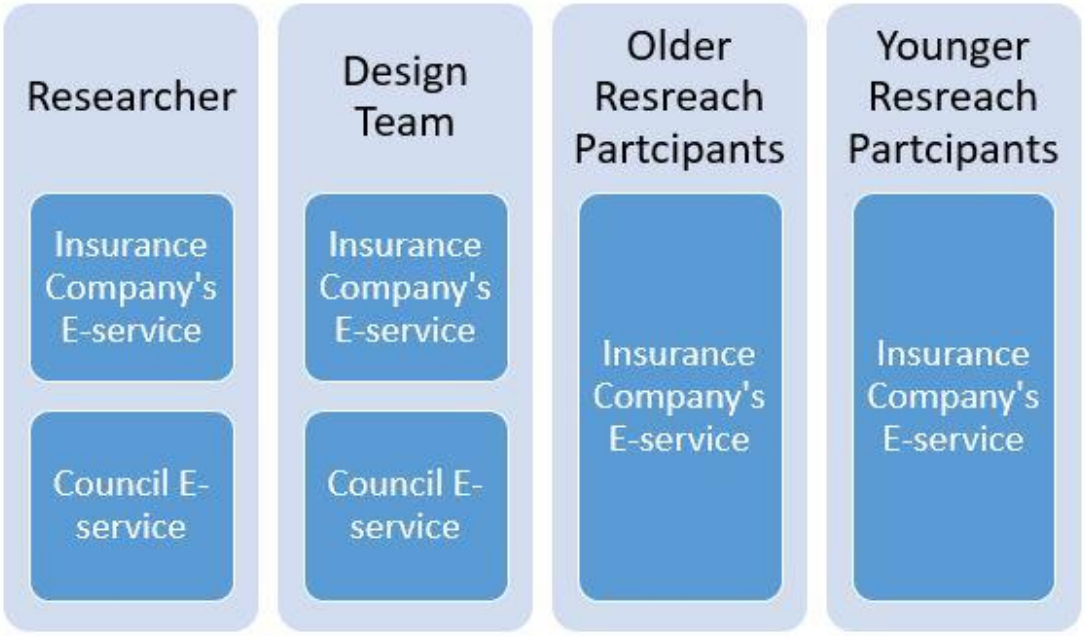



**Figure 9 - The E-services evaluated by research participants**

The insurance company was selected because it was slightly lengthy e-service that had different types of data to be entered by the user. It also scored highly by the researcher using the Inclusivity Metric, as the researcher was looking for an e-service that resembled the Council e-service in terms of complexity but was better laid out than the Council's e-service was.

For the Insurance Company's e-service, each group of research participants were given a scenario with all the details of a person who wants to insure his apartment. They were first asked to read the scenario very carefully, in order to understand what is required from them. After that, they were asked to access a link of for the insurance company e-service and fill the forms to get an insurance quote. Then they were given the Inclusivity Metric to evaluate their experience where they would an online survey and rate each question in 5 Likert scale (See Appendix 2). Finally, a group interview would be conducted to get their insights on the interaction with the Insurance Company's e-service and with e-services in general. The results of

the Metric is calculated by the researcher to evaluate the inclusivity of the e-service from the participants' perspective.

For the Council e-service, the researcher and the design team were given a scenario with all the details of a person who wants to register for social care services. A Social Worker who have experience in social care requests gave this scenario in order to have valid results from the interaction, it is important to note that the IT department was informed in order to make the e-services offline so the testing data does not end up in the social care database to be picked up by Social Workers. They were first asked to read the scenario very carefully, in order to understand what is required from them. After that, they were asked to fill the forms to request social care service for this person. Then they were given the Inclusivity Metric to evaluate their experience where they would an online survey and rate each question in 5 Likert scale (See Appendix 2). Finally, a group interview would be conducted to get their insights on the interaction with their own e-service as well as the Insurance Company's e-service. The results of the Metric is calculated by the researcher to evaluate the inclusivity of the e-service from the Design Team's perspective.

## 4.5 Data Collection

The data collection was divided into two phases, pre-implementation phase and post-implementation phase. The official implementation date for the Care Act is April 1st 2015, at this date the act become a law and all the new procedure followed around the UK. The data collection followed Keates and Clarkson (2004) design strategy model for inclusive design. However, the process is not as linear as it seems, it is more of an iterative process that often jump

from one step forward or back ward in organic way. Dividing the steps for creating inclusive user interfaces span to these five levels:

- **Level 1:** Investigating the requirements of the system or service in hand.
- **Level 2:** Looking at how the users will get the information from it.
- **Level 3:** Looking at how users understand the process.
- **Level 4:** Looking at how users enter data and manipulate the system.
- **Level 5:** Evaluate the system.

### 4.5.1 Pre-implementation phase

During this phase information was be collected from the Local Council regarding the pre-implementation state of affairs and how social care services were provided; highlighting the shortcomings of the previous procedure and the areas of improvement. This was done by interviewing the Care Act implementation team, online forms design team, social workers, and other interested parties like private care providers.

The Local Council ran various information sessions to inform the public about the changes in the social care services and the introduction of the Care Act. These sessions are very important to understand the full effect of the act on society and address concerns or possible improvements. The Local Council ran these sessions on different areas in the county. This provided the opportunity to be able to meet people and discuss the changes anticipated, especially since big number of private social care providers expressed mixed feelings about this change, which is completely normal in any change with this magnitude. This was important to get insights of their concerns to record them and address them during the design phase.

Social Workers paved the way to fully understand the way that current social workers are handling the workload and discussed the anticipated surge of demand that the Care Act will introduce. Moreover, discussions with the team responsible for the creation of the online forms was carried out to understand their design strategy to create accessible and inclusive online forms.

### 4.5.2 Post-implementation phase

After the implementation of the Care Act several interviews were carried out with social workers and the design team to see the impact of the Care Act on the demand and how the online forms helped to manage this demand. Also the experiments were be conducted to measure the usability and the ease of use of these forms based on the Inclusivity Metric these experiments were be carried out in the University's computer labs and participants were invited to participate using the emails and paper ads on the University. However, for older adult's charities were contacted to inform their members to participate. The participants were asked to perform some tasks in a website including the online forms of the Care Act and then they were asked to fill a survey that asks them about their interaction with the websites based on the constructs of the Inclusivity Metric.

After the analysis of the online forms was finalised, a meeting the Local Council design team was set to reflect on the issues with the current design, and the ways that this design can be improved. This meeting is aimed to help Local Council to improve their design strategy and make it more incline to Inclusive Design strategy. Especially with push from the UK government with initiatives like Digital First that encourages the local authorities to embrace digital means when interacting with customers.

## 4.6 Data Analysis

Thematic coding was used for analysing interview's and observation's data. All the interviews and the observations field notes were be transcribed and stored in NVivo11. A 'Code as You Go' strategy was used by which the codes were generated while transcribing interviews and field notes. While this strategy generated a huge number of codes, these codes were merged and organised in hierarchal order. The results were a smaller yet comprehensive set of thematic codes that can define the chapters of the thesis.

The high-level codes represent the main themes in the empirical chapters; these main themes correspond to an abstract idea that covers a number of supporting subthemes. Thus, all the subthemes have a strong relationship with each other and they collectively create the main them. An inductive process was used to create these themes and subthemes, as the themes sometime emerged from a top-down and bottom-up approach. In the case of top-down analysis the main topics discussed in the literature created a classification of the main issues to be outlined in the chapter. However, with a bottom-up approach interview data was coded by labelling quotes with the idea that they discuss, then aggregating these codes into subtheme and aggregating the subthemes into a main theme.

Using the functionalities in NVivo11, the researcher was able to move the themes around to create main themes and subthemes that collectively shape the empirical chapter. Representatives quote were used in the thesis to demonstrate the ideas and insights for each subtheme. Moreover, to demonstrate how some issues were important to the research participants a frequency count of the invocation of a particular theme was used. This helps to compare between each idea in terms of its frequency during the discussion.

However, two important notes should be considered about the utilisation of the theme frequency count. First, this frequency count does not represent a quantitative analysis of the data collected. The sample is too small to draw inference about the general population, nor was the research aiming to generalise the findings. As stated above in the research philosophical worldview (See Section 4.2 Philosophical worldviews) that qualitative research does not aim to generalise the findings or predict the behaviour if certain research participants. Qualitative research aims to provide deeper understanding of a certain phenomenon in a specific context, these findings can be theorised or expanded into other contexts.

The second issue, is that this frequency just shows the issues that the research participants mentioned. However, what is equally important is to note the issues that were not mentioned during the interviews. As the absence of some important ideas during the interviews might show how significant these ideas to the research participant. However, the absence of these ideas were explained in the observation data, to discover whether the absence was intentional or just that the notion did not occur to the participant at the moment. Especially since leading the research participant into conforming to the researcher ideas will not generate any knowledge and just confirm whatever the researcher wanted to believe (Lewis, 2015).

Moreover, the data of the usability testing sessions was also analysed using qualitative analysis. The results of using the Inclusivity Metric for each group were compared to see how different user groups perceive the value of the constructs of the Metric differently. The purpose of the Inclusivity Metric (Introduced in Chapter 6: ) was not to measure research participants' attitude

toward technology or user interfaces, the experiments were conducted to evaluate the e-services and highlight the main features that promoted ease of use during the interaction. As for the method in which the data were analysed with. The results of the Inclusivity Metric were first put into a database. Then, imported to a Microsoft Excel so the data is averaged for each construct to demonstrate the sub-rating for each constructs. After that, the average is calculated from the average of each construct to create the Inclusivity Index. Then, the results are then compared and corroborated with the interview and observation data. Transcribed interviews and data were analysed using the same analysis technique used for the other interviews. All the data were coded in order to show how each participant viewed aspects on the e-service design in light of the Inclusivity Metric

## 4.7 Reflexivity

Similar to any research method, the researcher needs a way to proof the quality and rigor of research. In quantitative research it is done by proofing that the methods used are valid and reliable to reject or not to reject a set of hypotheses in a reductionist approach, given their view of an objective reality and the need to reduce researcher bias or influence in the field. With qualitative research on the other hand, the notion of reflexivity is used to demonstrate the quality of the research and its findings (Malterud, 2001). As in qualitative research the idea of an absolute objective reality is widely rejected, as the ontological assumptions of qualitative research incline to a subjective reality by which people -including the research participants and the researcher- construct their social reality. So the notion of reducing the role of the researcher is not applicable, as the researcher is actively involved in the construction of this social reality. Qualitative research encourages subjectivity and places lower emphasis on generalisability, as it assumes that even if a group of

researchers are studying the same issue, they are more likely to discover different things as their experiences and prior knowledge will affect their way of studying this social reality.

Reflexivity allows the researchers to systematically attend to their role in the study and ultimately in the social reality, as Steedman (1991) states that "knowledge cannot be separated from the knower". Qualitative researchers need to be self-aware of their presence in the social world and what 'theoretical baggage' do they bring to it while researching an issue. The researchers need acknowledge their knowledge and experience to in order to advance the knowledge (Robertson, 2000). Thus, acknowledging that the researcher is part of the research.

> "[…] Reflexivity enhances the quality of research through its ability to extend our understanding of how our positions and interests as researchers affect all stages of the research process." (Primeau, 2003)

With an immersive research design such as Action Research, the researcher needs to be reflexive to deal and legitimise the relationship between the researcher the issue to be researched (Coghlan and Brannick, 2014). Being reflexive is an integral part of conducting Action Research, especially with cyclic nature of Action Research. Not just as Kemmis et al. (2013) explained that reflecting on the data gathered –and created- in order to plan the next iteration, but also to the researcher interaction with the social reality and his/her underlying assumptions. It is worth mentioning that reflexivity is not a one-time thing, throughout the research various reflexive cycles will be enacted, moving through recursive iterations to demonstrate awareness of self, methods, and assumptions (Hibbert et al., 2010).

### 4.7.1 Methodological Reflexivity

Coghlan and Brannick (2014) argue that each ontological and epistemological approaches use different reflexivity types. They argue that only positivistic approaches should employ methodological reflexivity, as they focus on the research tools rather than the researcher. However, methodological reflexivity is still relevant to qualitative researchers. As researchers need to be aware of the impact of research methods and the way these methods produce knowledge. Choosing the appropriate method amongst a wide variety of research methods is crucial part of research as different methods extract –or construct- knowledge about certain idea differently. This 'methodological awareness' is key to justify findings, as these methods come with its own strengths and shortcomings to discover the 'truth'.

With the research, interviews were used as window to explore the issues that hinder computer use for older adults. Here interviews were used in the most romantic account, as Alvesson (2003) states that romantics believe that true knowledge exchange happens when the researcher build a strong environment of trust that enables the interviewee to share freely. Not being associated with the Local Council, can allow interviewees to talk more freely as they will not be concerned about political agenda of social workers. This disassociation can backfire as well, as some might be reluctant to share care information with a researcher outside the Local Council. Here again romanticism plays an important role to truly connect and build rapport with the interviewees, to show that the researcher is on their side. With such interviews the researcher need to demonstrate his/her involvement in the issue, especially since older adults tend to be a bit hesitant to talk about their struggles with computer use as it can confirm unfavourable social stereotypes about them.

Reflexivity in this situation needs to address the value of using the research method –Interviews- and research method strategy –Romanticism- to study the issue at hand. Justifying interviews and admitting their shortcomings can provide rigor to the research. By critiquing the method and demonstrating how the method is the most suitable to explore the interviewee understands of the issue. The role of reflexivity here is not to show that such method is the 'best' but to show that it is the optimum method of inquiry. The assumptions about the interviewees willingly telling the 'truth' in romanticism needs to be addressed, as these sincere conversations does not always provide truthful accounts (Alvesson, 2003). So being able to use different qualitative modes interchangeably to verify and triangulated the findings is key to being reflexive.

Moreover, observations were also used to identify the issues that hinder the use of computers by older adults, with such ethnographic method new opportunities to shed the light on the obstacles that hinder computer use, whether physical or psychological. Reflexivity here is very important; as such interpretation of an observation relies heavily on the observer. Especially since the observer have some focal points that s/he wants to look at, so it is important to be as vigilant as possible to new things that can inform the observer about new concepts rather than trying to confirm –or reject- a prior concept whether in the literature or in the observer's head. However, it is worth saying that bracketing off observer's pervious knowledge is not the optimum –or even feasible- way to achieve the aspired 'open-mindness'. Being reflexive and attentive to observer's own agenda is important to improve the rigor of the research. Also, the observer presence in the field can add a new dynamic that needs to be addressed. In the case of older adults using computers, being a younger observer in a session for older

people can affect how they would act normally in the experiment's sessions.

From a methodological reflexivity perspective, the need to justify the fit of observational methods is important. As these methods provide insight on how the research participants behave beyond what they think they do, especially since interviews provide an account of what people think is the 'truth'. With observation the researcher can see for him/herself, and can draw upon what was observed to properly interpret such behaviour(s). To be more reflexive the researcher can verify interpretations with the research participants, that way the researcher can challenge his/her priori and reflect deeply upon the interoperations drawn at various stages of the observations. This reflexive verification of interpretations can provide new windows of learning and changing the power dynamic of the research by providing more opportunities for the research participants to justify or verify their behaviour.

With Action Research the role of the researcher is blurring and continuously changing. As the researcher wears different hats throughout the study, in the case of observations the researcher moves from a passive observer at times to an active actor in the field. This in itself gives the researcher an opportunity to discover different angles on the issue at hand, hence being more reflexive.

### 4.7.2 Systematic Reflexivity

This form of reflexivity aims to manage researcher's bias, it is more directed to point that the researcher's intentions are in the right place to provide rigor on the research findings (Maton, 2003). Dowling (2006) argues that role splitting is problematic in qualitative research, as some researchers separate their previous role in the industry and their current role as researcher. The researcher must be

aware of his/her background and its difference from the current researcher role that s/he plays; especially for action researchers, as they alternate between the role of researcher and consultant while conducting the research.

Subjectivity statements are one of the essential tools to enact reflexivity, while these statements allow management of this subjectivity. Subjectivity statements help action researchers to identify and document their personal beliefs and experience (Preissle, 2008). This helps justifying the quality of findings to other scholars, and shed the light on how such conclusions were drawn based on the clarification of one's belief system and thought process.

Moreover, reflexive researcher dairies can be beneficial for reflexivity as well. The researcher in document his/her thought process, providing the researcher a point of reference to changes in his/her assumptions and the reasons behind such changes, which ultimately can inform methodological and theoretical decisions (Sara Nadin and Catherine Cassell, 2006). Maintaining a reflexive diary for observations and interviews is important to track the researcher thoughts while interacting with participants. For instance, keeping record of responses gathered during an interview on a page and documenting the researcher's interpretations and feelings on an adjacent page to link and cross reference concepts at later phase of analysis.

## 4.8 Research Context

The Care Act was introduced in May 2014 as response to the growing complexity of the social care system in the UK. The Care Act was created to replace and modernise old social care legislation that go far back as 60 years. These old legislations were very difficult and hard to comprehend for a person who is looking for social care or the

people who are involved in the social care system like carers, and private social care providers.

The Care Act sets the rights for those who need care as well as carers to manage the expectation of those constituencies, along with setting new responsibilities for local authorities and their partners. Many changes are introduced within the Care Act but perhaps the most sensationalised topic in the media is the introduction of the cap for social care costs, that ensures that no one should pay more than £72,000 for social care services in their lifetime, this topic in particular sparked public attention to the importance of the Care Act and spurred debate in the general election. As the cap means that people do not have to get loans or sell their homes to cover the costs of social care (Brindle, 2014; Triggle, 2015).

Moreover, the Care Act ensures a fairer system by the introduction of nation-wide minimum eligibility threshold, which ensures that people have the right to access social care services regardless of their location in the UK. Also one of the main pillars of the Care Act is being proactive in trying to delay the need for social care services, local authorities are required to provide information and advice to the people in their constituency to help them understand the system and provide them with the tools required to plan for their future to reduce the need for social care services. The act was introduced in phases the first phase was implemented in April 2015 which covers assessments, care plans, direct budgets, and payments. The second phase in April 2016 included the introduction on the care cap.

### 4.8.1 Changes in the Social Care System

The Care Act is a historic reform the social care system and as stated above the Care Act entails many changes to the social care

system in the UK. In the following sections a rundown of the changes in the social system is presented to show how the Care Act if going to change adult social care.

#### *4.8.1.1 Responsibilities for local authorities*

In the Care Act the local authorities have been given new responsibilities to better take care of their constituencies. One of the main pillars of the Care Act is well-being, the act puts promoting well-being as one of the most important responsibilities of local authorities and extends will-being to include: (1) Personal dignity; (2) Physical and mental well-being; (3) Abuse Protection; (4) Control over daily life; (5) Participation in work, education, training or recreation; (6) Social and economic well-being; (7) Domestic, family and personal relationships; (8) Suitability of living accommodation; (9) Contribution to society. The act also requires local authorities to try to prevent and delay the need for care by providing the information and tools to spot and solve conditions before they become bigger and require professional care. Integrating health and social services is one of the responsibilities added to the local authorities. While this is considered a long term goal, the Care Act paves the way for such integration. The act also requires local authorities to ensure that the quality of the social care services are within acceptable limits and does not fall short on the expectations of the local residents (National Archives, 2014).

#### *4.8.1.2 Meeting care needs*

The Care Act regulates how local authorities can meet the needs of the local residents. Authorities can either delegate the social care services to a specialised partner, provide the service themselves, or by making direct payments to the beneficiaries. In terms of these partnerships between local authorities are encouraged to ensure diversification of services and increase public trust. Moreover, if the local authority has the capability to provide the service, then they can

provide it directly to the beneficiary. While direct payments gives the beneficiaries a certain amount of freedom to choose their care providers the see fit (National Archives, 2014).

#### *4.8.1.3 Assessing needs*

With the Care Act the local authority can assess the needs of both the person in need and the carer as well. The person in need can be referred by him/herself to be assessed to see if they are eligible for social care services this assessment can be done in person, over the phone, or by actual visit to the local authority. Also General Practitioners (GPs) and people close to the person in need can refer him/her to be assessed by the local authority. The assessment process should cover the same elements in the national minimum eligibility criteria. On the other hand, if a person refuses assessment the local authority should respect his/her wishes while providing information and advice link with the person if needed (National Archives, 2014).

#### *4.8.1.4 Assessing financial resources*

Along with assessing needs of the individual, the Care Act also requires local authorities to assess the financial situation of the person requiring social care services. This is to help ensure the well-being of the resident and availability of sufficient financial resources to be able to take care of such needs. It also paves the way to fully implementing the cap on social care services, costs accrued should be also assessed to ensure that it does not go beyond the social care cap of £72,000 (National Archives, 2014).

#### *4.8.1.5 Actions after assessments*

After the assessment the Care Act requires local authorities to first create a care plan of the person in need, outlining how the needs social care needs of this individual is going to be met. Whether the services are going to be delivered directly from the local authority,

delegated to social care partner, or substituted with direct payment to the individual; the local authority is required to communicate that directly to the assessed individual. The local authority should create a care account for each person receiving care or caring for another person, showing them exactly what services are they using and providing information and advice regarding these service and any other service as well (National Archives, 2014).

### 4.8.2 Changes in the Assessment Procedure

The research is focused on the assessment procedure in particular, since it is the step that will be affected the most upon the implementation of the Care Act. The assessment of care request will be delivered online as well as the over the phone, or in person. Moreover, the Local Council is very keen on providing a seamless user experience using any of the channels mentioned above. However, given the anticipated surge in demand for assessments and low availability of social workers due to budget cuts, residents in Local Council jurisdiction are encouraged to conduct the assessment online promising that it will not affect their social care outcome. In the following sections is a comparison between the previous assessment process and the one to be adopted after the implementation of the Care Act.

The Changes are not just an automation of the previous procedure; it is rather a redesign of a system process to bring it to the 21st century. The new assessment procedure will incorporate all the systems used for assessing people's needs into one online service that can interface with all legacy systems and provide the appropriate result whether it is used by a social worker or by the person requesting the assessment.

#### *4.8.2.1 Pre-Care Act Procedure*

The assessment process before the Care Act was solely conducted by the council staff; the customer support representative will either receive the assessment request from the person requesting social care services, the people close to that person, or the GP in charge of that person. First and foremost, the person has to consent to being assessed as the assessment will not be conducted unless consent was given. After that, the customer support representative asks certain questions about the state of the person requiring the services whether from the person or from the referrer. Then, the person is will be assigned to a social worker to triage the person's condition. Finally, the person gets a call back to discuss the social care plan and the services that the Local Council can provide for him/her. The process is laborious and takes a long time to finish, it can also be embarrassing for people with sensitive issues that they do not want to talk about with a customer support representative.

#### *4.8.2.2 Post-Care Act Procedure*

The Care Act encourages using digital means to engage with the local residents, the assessment process in the first step that the person requesting services or referrer does to initiate the social care request. With the Care Act in place, the customer representative, the person requesting the assessment and the referrer will the same assessment request page. This is very helpful if the person needs some clarification on certain item in the form they can easily call the customer support team and they can help them or pick up the form from there and fill it for them. However, this is not the ideal way and is considered safety nets if users really want help, as users are encouraged to fill up the assessment by themselves. The form is saved for the users if s/he chooses to take a break or come back to it at any time as all users will be given user accounts, this can help

users track the status of their forms. The form also provides help text to further clarify any complicated words and enhance user understanding of the purpose of each question. After submitting the form, an email notification is sent to the user with a reference number so they can quote that number whenever they need to speak to the Local Council. Then, the person will receive a phone call or a visit to triage his/her case by social worker. Finally, the social worker works out a social care plan for that person and assigns them to the appropriate team that can provide the services that s/he requires.

### 4.8.3 Local Council Implementation Plan

The Local Council started awareness campaigns about the Care Act from September 2014 to ensure that all constituencies and beneficiaries are aware of the changes coming to social care in the UK. Information sessions were delivered at various locations in the county; these sessions were targeted to private social care providers, social workers, and key partners of the Local Council. The Local Council also created a Care Act Team in charge or interpreting the act, and prioritising the key issues that needs to be addressed for the successful implementation of the act in April 2015. While recognising that the assessment procedure needs to be digitised, the Care Act team delegated the task for creating the online assessment forms to the IT department within the Local Council, who decided to create the forms in-house and not rely on external vendors.

The forms development team quickly realised that it is not just process automation, it was more of business process redesign effort that requires more people from different departments to be involved. So design task force was initiated to address the needs of different constituencies involved in the assessment process, team consisted of social workers, IT developers, user journey specialists, and customer support representatives. The task force met on weekly basis to

discuss the optimum way to create the assessment forms with violating the Care Act requirements. A significant amount of consideration was put on the wording of the forms to make it clear for a novice user who is not familiar with the language used in the social care context. After the creation of the beta version of the forms, the customer support representatives were allowed to test it using data from old cases that they have and report to the task force to ensure if anything needs to be done to improve the form. The customer support team was given some time to train on using the new online forms before April 2015. It was also agreed that before going live with the forms the team would want to test the forms of actual users, however due to time constraints these tests were delayed after the going live with the forms as way to further improve the forms in coming design iterations. Further suggestions to improve the online forms will be given as survey to the users of the form, to understand the areas that need more attention in the form and in the interaction with the form.

## 4.9 Summary

This chapter outlined the research methods used in this thesis; first, it highlighted the research's philosophical worldviews. After that, it outlined the methods used to inquire about the research problems, which are interviews, observations and experiments. Then, the chapter presented the data collection process and how the data were analysed. In addition, the chapter highlighted how the researcher intended to improve the rigor of the research methods used by being reflexive. Finally, the research context was presented to get a full idea about the situation in which the study was conducted in.

In order to put things into perspective and link the three pillars of research (i.e. problem, method, and theory). The research problem

is first identify the reasons why Inclusive Design is difficult to implement and how can we improve its implementation in small e-government context. Especially since being able to respond efficiently and effectively to as many users as possible is very important to IS success.

This problem suggests the use of qualitative methods and more importantly intervention approach, this is why Action Research was chosen in this research. Action Research provides a platform to investigate the problem in a specific context with the research participants and collectively help to solve this problem. In the case of this research, the researcher first tried to identify the obstacles that stand in the way of Inclusive Design implementation by digging deeper on the issues and circumstances in this particular system design. The methods used in the beginning which reflect the on the first phase of Action Research which is discovery, were mainly ethnographic methods to allow the researcher to have a deep understanding of the issues hidden in the research context. Then, an intervention was carried out to first design the system, and evaluate it using the Inclusivity Metric. A step that reflects on the act, and evaluate phases of Action Research.

In terms of theory, this research utilised usability theories by Norman (2005), Shneiderman (2004), and Nielsen (1994a) to develop the Inclusivity Metric that was used in this research to evaluate the inclusivity of the e-service. This research extended the work done on usability to improve theory and practice, and more importantly helped to overcome a problem in the research context by applying and modifying usability theories to construct the Inclusivity Metric that helps the designers to ensure that their designs are usable to as many users as possible.

# Chapter 5: The Enablers and Disablers of Inclusive Design in a Small e-Government Context

## 5.1 Introduction

The previous chapter concentrated on the research methodology. Pinpointed the philosophical assumptions of the researcher, and the research methods used that reflects these assumptions. Laying the foundations to analyse the data collected during semi-structured interviews and observations. As mentioned previously one of the research questions of this study is aimed at understanding the challenges faced by organisations trying to implement Inclusive Design solutions to target wider audience and bridge the age-based digital divide which will be discussed at length in the proposed solution in Chapter 6.

This chapter corresponds to the discovery phase of Action Research which concentrates on outlining, describing, and analysing the challenges of designing inclusive e-services in a local e-government context. The findings in this chapter draw the path for the solution proposed in Chapter 6 that demonstrates the second and third of the Action Research cycle which are the action and evaluation phases. This chapter covers an implementation of a new online service to allow customers in a local Council to register their information and to request social care services. As easy as this may seem building an inclusive e-service is far more difficult due to the inability to define Inclusive Design as well as the challenging task of understanding new legislations. Providing accessible services to customers is task every public or private entity strives for. However, this chapter shows how challenging it is by highlighting the difficulties encountered by the design task force in charge of designing the e-service that captures customers' condition and feeds it into the case

management system to be picked up by a social worker to evaluate their case a purpose appropriate options to each customer.

## 5.2 Emergent Themes

Using the thematic coding technique mentioned in Chapter 3, the headings in this chapter correspond to the themes that had emerged from the interview and observation data. For this chapter the interviews were conducted with 15 research participants all of whom are either members of the Design Team Task Force, or individuals with special interest in the Care Act implementation in the Local Council. These participants were asked about their insight about the challenges of implementing an inclusive e-service as part of the Care Act, and what they perceived to be the steps needed to properly implement the electronic solution. FiguresFigure 10,Figure 11Figure 12 show the data analysis process that led to the discovery of these themes. These Figures show the emergent themes from the collected data supported by some evidence. Also, they show initial interpretations to give sense and meaning to the emergent themes. In section 5.7 where the themes are analysed, the relationships between these themes will be discussed to provide an overview of the themes and their relationships within the context.

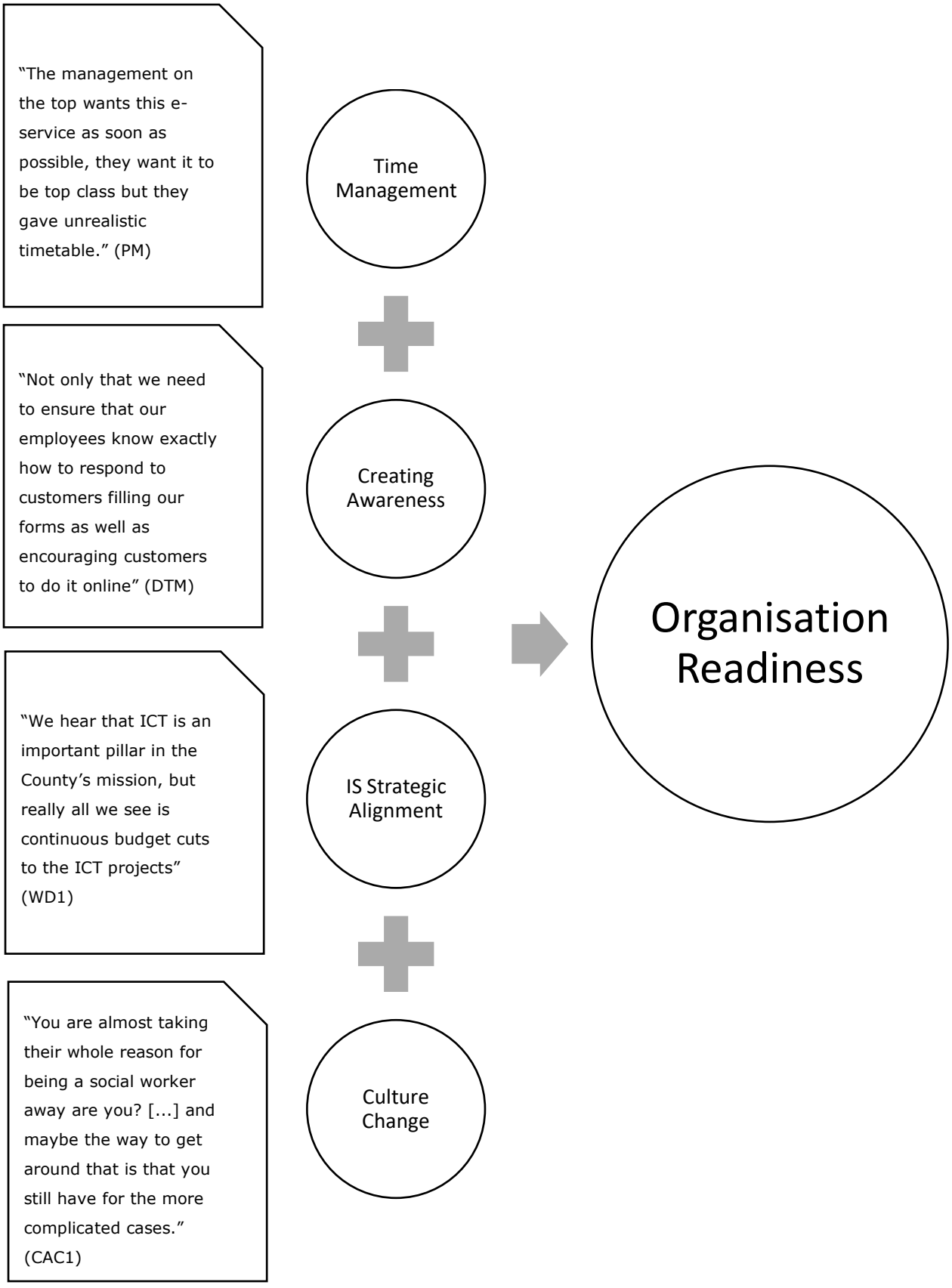



**Figure 10 - Organisation Readiness main and subthemes**

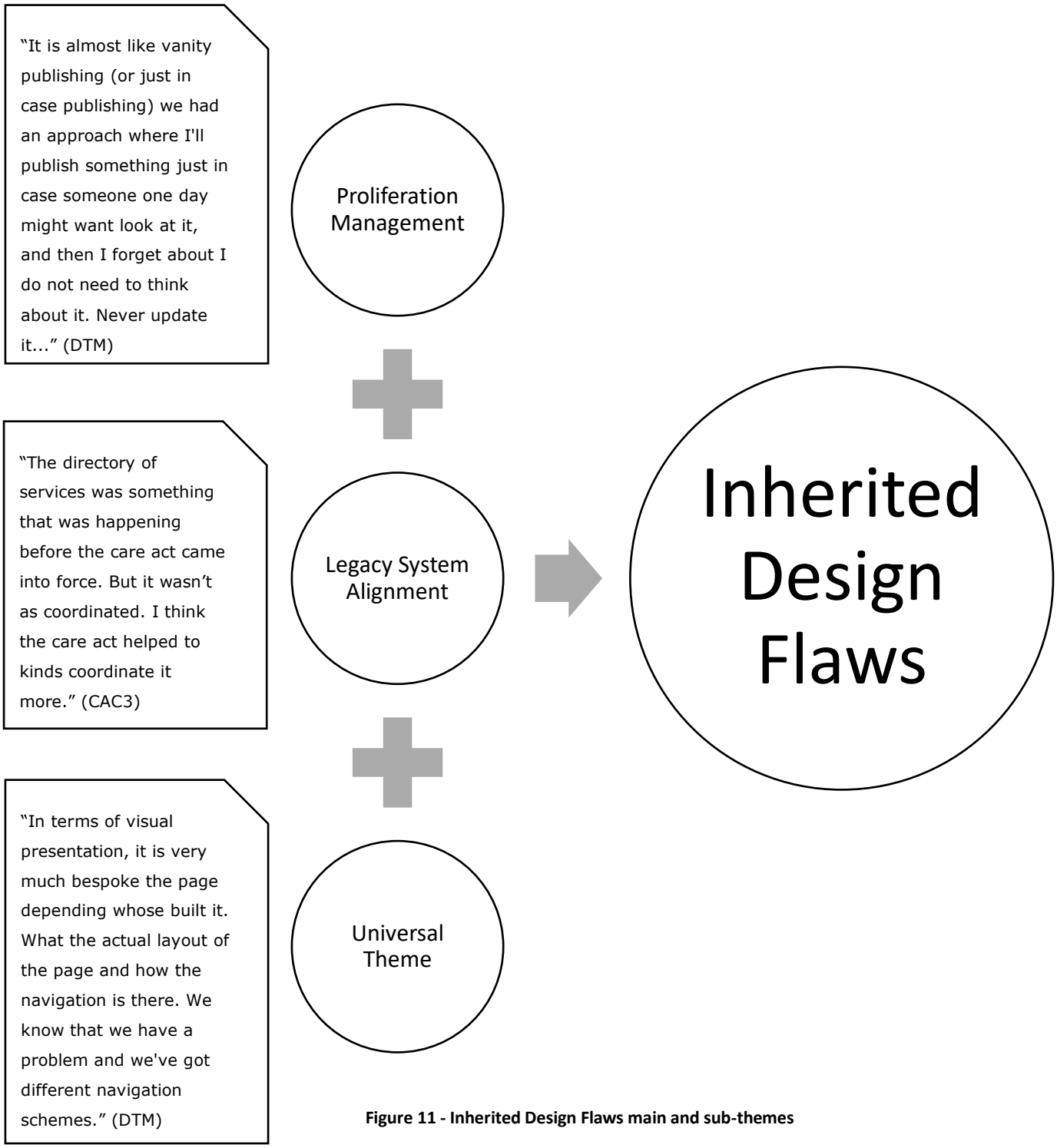



**Figure 11 - Inherited Design Flaws main and sub-themes**

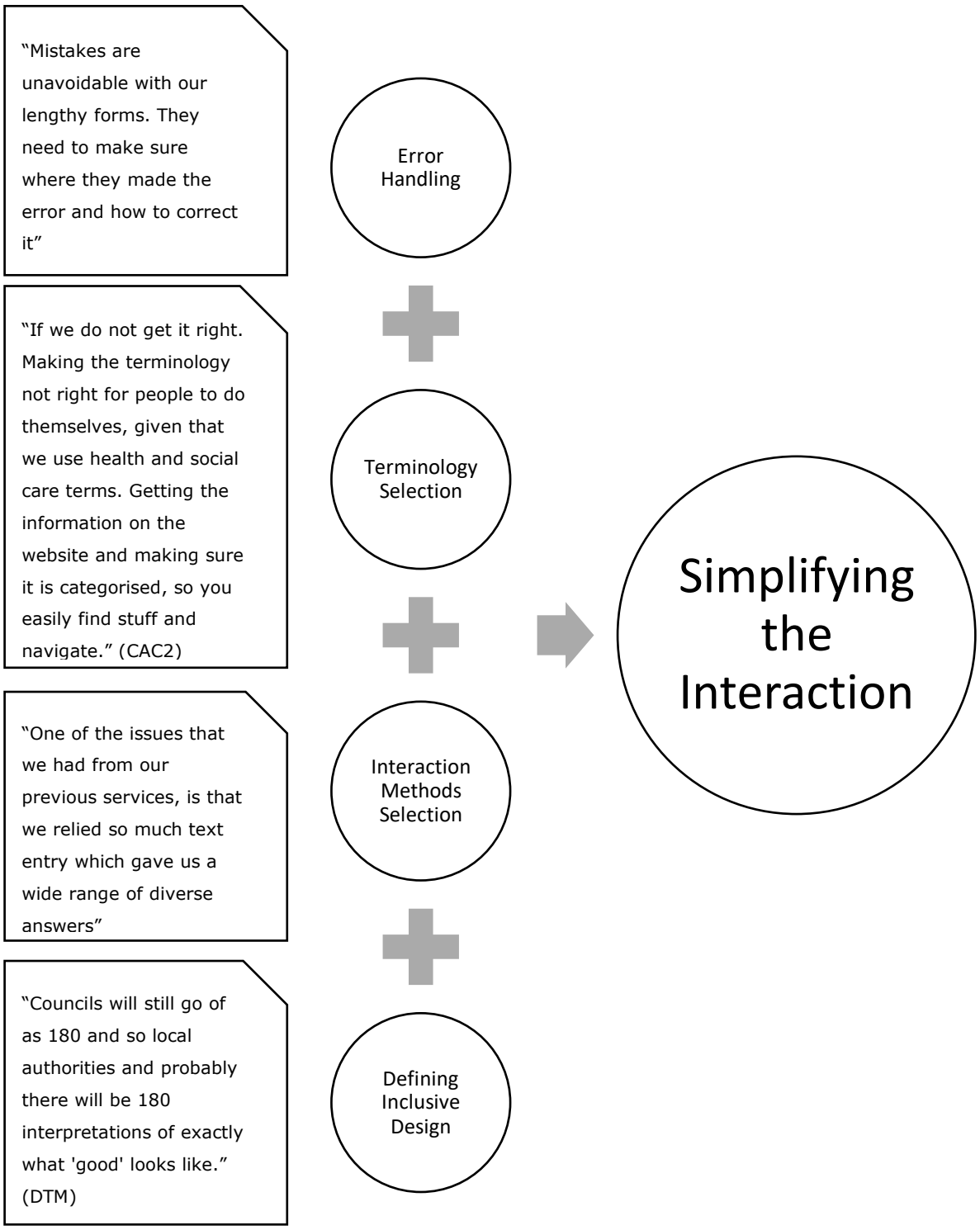



**Figure 12 - Simplifying the Interaction main and subthemes**

## 5.3 Organisation Readiness

This theme corresponds to comments and observations that described the Local Council's state of readiness to adopt a new Inclusive Design approach. This theme was mentioned frequently among the research participants by identifying the challenges of the implementation to 4 subthemes that collectively lay the foundation of the issue about the organisation readiness. These subthemes shed light on the strategic and work culture issues that obstructs the implementation of a true inclusive e-service that enables older adults to engage online with the council.

From the comments made by the participants of the design task force, it was indicated that the Local Council was not prepared for a project of this magnitude as the Care Act 2014 implementation. The project came into the Local Council to bring change in the way the council did things and in the way that it reached out to its customers. However, this change became overwhelming to the Council as this was their first time tackling a project of this size and building an in-house e-service that should become a role model for all future e-services to be provided by the Council. This concern was very obvious by the Digital Team Manager.

> "I think it is a huge change to council and Care Act has been almost like a baptism of fire because of the time scales and the size of the impact. That we all have to learn fast and know what works best or does not in terms of getting information from each other and design they solution that best fit everyone. We've got to do both from user or business side." (DTM)

Moreover, comments from one of the Social Workers indicated that the Council should have expected such legislation, due to the

change in circumstances in the demographic of the county; suggesting that the County was slow to react to these changes.

> "We should have expected it, really […] it is obvious that we have an ageing society, and our current number of social workers cannot handle all these social care requests. So we had to implement electronic solution that can substitute our routine tasks." (CAC3)

Meanwhile, the Project Manager acknowledged the inevitability of such improvement in service handling. However, he believed that the senior management would elect to buy an off-shelf solution and do the required modifications to it as they did in the past.

> "Honestly, I did not think that the senior management would finally listen to the stuff we have been saying for years. That in order to have a solution that will meet our needs exactly we have to develop it in-house rather than playing a game of cat and mouse with the software suppliers." (PM)

These comments above show the difference in the organisation communication with its employee. As some of them were very aware of the changes and others had such negative view of this change. Their decision to do the e-service in-house was met by a host of mixed responses. Some hesitation was obvious in the Digital Team Manager as she questioned whether the senior management would be given them enough freedom to properly develop this service.

> "Be that as it may, since we're doing it ourselves we have to get enough time to achieve our goals, and looking at how fast things are moving I have some doubt about our readiness to tackle this project." (DTM)

### 5.3.1 IS Strategic Alignment

This theme emerged conversations about evaluating of the IS position in the Council's strategy. If an organisation genuinely believes that IS is a strategic asset and they can use it to provide customers with an efficient service as well as have competitive advantage over other counties, they would have invested in establishing a strong ICT infrastructure and discovered new ways to improve the effectiveness and the efficiency of their services. IS can facilitate a customisable and convenient way to interact with customers, thus reduce the operational costs for the council as well as provide timely information to the customers. The circumstances around the changes brought in by the Care Act in the Local Council provide a suitable environment to pursue inclusive e-services. Especially since it aligns with the Council's strategy to embrace IS more effectively. The Care Act forms provided the freedom as well as the challenge to tackle such endeavour. The Digital Team acknowledged that current e-services provided in the currently are not appropriate to reflect the IS value to the County's overall strategy.

> "The [current] website does not fit the purpose in terms of the design, the platform that it sits on so we have the potential to change and adapt that so the council is going through a transformation project which is called Digital First." (DTM)

When asked about the way they believe that would help to bring it up to the standards of Digital First initiative, a completely radicalised approach will be taken to ensure that there is no linkage to previous projects that over flooded the current website with unnecessary pages. These inefficiencies will be discussed in details in the Inherited Design Flaws Theme.

> "We are actually completely rebuilding the website. We are not migrating we are building it form the ground up. So I think the Care Act forms are some the first bits that we are building in the new system that we are using the new designing the new user research user testing." (SA1)

However, there is still some hesitation about whether IS is truly a strategic asset or just a mere tool in the Council's strategy. The funding that IS receives for has reduced significantly compared with previous years. Many respondents casted doubt to the Council's seriousness to utilise ICT as a strategic asset, one of the Web Developers voiced this hesitation when asked about the importance of ICT in the County.

> "We hear that ICT is an important pillar in the County's mission, but really all we see is continuous budget cuts to the ICT projects […] So how can we truly say that we will depend on ICT to deliver our services if we do not have any money to fund our projects." (WD1)

On the other hand, the Project Manager and a Web Developer insist that the senior management values ICT, but the ICT projects usually takes more time to justify the costs. Suggesting that if the ICT projects are proven to help the Council in reduce costs amidst their austerity measures.

> "I think the problem reside with us as we do not provide a good case for our ICT projects for funding […] we need to show the benefit of our projects in terms of money saving which usually takes longer for ICT projects." (PM)

> "The idea that an Inclusive Design can help the County to attract more customers while maintaining the number of staff with minimal costs was very lucrative to the Senior Management." (WD1)

Moreover, the high demand anticipated with the launch of the Care Act will further complicate the issue. Since this e-service needs to respond and provide quality information to a large population at the same time. While Social Workers need to be ready to tackle harder cases, not help filling in social care forms. The big issue here is that there are not enough Social Workers in the Local Council to address such demand. This means that the e-service should be responsive and comprehensive to respond to wide array of social care requests.

> "We are expecting another 9000 people just for assessments, which is more than double what we currently have. Our current information perception site is probably the one that's most used, we have between 4000 to 5000 unique hits a month bearing in mind these are people newly diagnosed with a long term condition. That's fairly high." (CAC2)

Thus aligning IS with the overall strategy improves the readiness of the Council to build an inclusive e-service and ensures senior management buy-in especially during tough financial times. Moreover, it helps the ICT department to understand where the Council lays in terms capacity and investment in new projects.

> "I think involving us in the strategy meeting is an important step that the Council has made this year, it gives us an opportunity to voice our concerns as well as make more sympathetic to budget cuts." (PM)

The characteristics of this project in particular made the senior management buy-in much easier compared with other ICT projects. Given the labour intensity of social care services and the need to reach out for customer base that has low technology acceptance, the project fitted nicely with overall Council strategy.

> "Luckily for us the Senior Management understands the need to use an Inclusive Design strategy for the Care Act project, since it fits with the diversity our prospective customers empowering them to make select their own social care options." (PM)

### 5.3.2 Culture Change

This theme emerged from the discussion about the Council's readiness to embrace a cultural change, as the Care Act comes with a host of complexities that came at a time where the Local Council was trying to reconfigure its image and modernise its approach. From these discussions the Care Act was views as the spear head of change, as this change aligned with the Local Council IS strategy to extend their services online so customers can interact with the council conveniently. This notion was also echoed by a Care Act Consultant, she insisted that the enactment of the Care Act was not just a matter of process automation; it was more profound and multifaceted change in the Council's strategy.

> "The implementation of the Care Act is a culture change. So it is not a question of resistance of social workers it is a must do and this how we are going to change the way we work. That will be a beginning of cultural change which will take place over the next year as the care act is introduced." (CAC2)

The enactment of the Care Act also changed the role of social workers, since some of their low level responsibilities will be carried out by online form. However, this should not be viewed as negative thing as these responsibilities taken are minute, thus allowing them to handle more complex issues. Two Care Act Consultants coincided.

> "You are almost taking their whole reason for being a social worker away are you? No one trained to be a social worker because they wanted to sit on the end of the phone, phone people up and to look at online forms that they filled in [...] and maybe the way to get around that is that you still have for the more complicated cases." (CAC1)

The Social Worker elaborated about the changes in their tasks, highlighting that with these changes a true utilisation of the Social Worker's skills can be achieved to perform high level consultations.

> So instead of having them having to do some of the low level ones that they do at the moment the social worker will still be going out but they will be using their expertise for the most complicated ones. It frees social workers to a degree and so we might not need as many social workers but those we do need you'll be more specialised you'll be looking at more complicated work there's a change in the way they work." (CAC1)

> "I believe that we are ready to challenge our previous roles and step up to the new requirements […] my colleagues and I are a bit excited about these as it will allow us to do more exciting tasks than just answering phone enquiries." (CAC3)

Apart from the previous Social Workers enthusiasms about empowering customers to engage with the council and collectively

make a decision on the social care plan. Some social workers have voiced their concern about the notion of inclusive e-service and allowing customers to fill complex social care requests online.

> "I do not know if it will work really […] letting customers who are not familiar with the social care process and most importantly never used a computer do the process by themselves is going to be tedious." (SW1)

> "I'm worried that it would double the workload on us, we already have enough on our plates." (SW2)

### 5.3.3 Creating Awareness

This theme has emerged from discussions about publicising the changes to the social care system and how the Council plans to create awareness to prove the Council's readiness to effectively handle the demand. However, people do not go to County/City Councils to inquire about social care and their options. The same Care Act Consultant highlighted the difficulty of interpreting the Care Act and communicating the benefit of online service to complement and later replace current social care procedure.

> "Social care system is not something that is generally people know about, people do not know about it, they do not know who they have to talk to, and they do not know what the options available are […] you would not know that you can ask the Local Council. People normally go to doctors when they see something wrong." (CAC1)

He also stressed on predicament of building customers' trust and moving beyond the stigma the quality of information provided by the Local Council. This means that the Council needs ensure that

information provided in e-service is clear and easy to understand by any customer with no background on social care.

> "There are some studies that have come out in the last couple of weeks funded by the Department of Health, it says that people do not trust the Local Council they do not trust the information that they provide so that's another barrier we've got. This is not just digital information [...] this any information we give out there still a bit of stigma associated with us." (CAC1)

Moreover, the Digital Team Manager pointed that it is equally important to demonstrate the value of the new forms to employees as well. This helps to create consensus among them and give a sense of where things are going in the future of service delivery in the Council.

> "Not only that we need to ensure that our employees know exactly how to respond to customers filling our forms as well as encouraging customers to do it online." (DTM)

### 5.3.4 Time Management

Cost and time constraints have been well debated amongst the project team during the design phase. Some claim that they should just stick to regular online form so the Local Council can provide the e-service in the agreed upon date. They admire the notion of Inclusive Design; however, they cannot commit to this strategy for this particular project due the cost and time pressure. During the design sessions one of the Care Consultant brought up the issue, when the features of the website were being discussed and their effect on the project schedule.

> "I think there are already quite a lot of people who are computer literate older people, and with the support for some people they can do it well on their own. Those people who are really resistant won't do it." (CAC1)

While the User Interface Designer demonstrated that the Local Council's image reconfiguration is highly dependent on this project in particular. This e-service to be designed is the going to be the baseline for all e-services offered in the Council's website in terms of layout, interaction, and ease of use.

> "We do not want to do the same thing that we did with other projects, by saying 'Oh let's get it up and running and then think about making it prettier!' […] We need to take into account the all these issues that relates to the inclusiveness of our website head on it not just about making it pretty." (UID2)

Being proactive in ensuring that the e-services offered are well suited to all customers regardless of their abilities is essential to reducing the work load on social workers as well customers. While it is true that the initial time to design inclusive e-services is longer than designing a basic e-service, however it has more benefit in the long run. The amount of time that will be wasted in redesigning is much longer compared with the time needed to design it as the beginning. It is also important to demonstrate the value of an inclusive e-service to senior management and the project to build enthusiasm about the project. One obvious justification is that it will help in the reduction of operational costs. Inclusive e-service will help in reducing this cost by allowing customers to register themselves instead of requiring social workers to aid them in this minor yet complicated process.

"The driver is that we will be reducing work force, some of those people as result of that will drift off into other jobs. We are not doing it because it is nice to do it, or save us money, at the end we are doing because we've got to do it." (CAC1)

"If the forms are all there and easily laid out in the standard letters they can just find them and use them. While they know if they go on the website what they find is useful to them. I think it makes their jobs much more difficult if their stuff is out of date." (CAC3)

Another set of constraints deals with the technical capacity of the project in allowing the flow of information between different systems without compromising the integrity of the data being transferred. Especially when dealing with sensitive information that covers a huge aspect of the customers daily routine and personal information. While being able to capture this information and parsing them in the correct format for the case management system is something. Being able to insure that customers understood what is required of them and provided the appropriate information is another.

"Obviously a huge thing around it is because we are having people's details. We have big policies around security that's something done from our technology side. And the information will be fed into our case management systems so that's another source of compromise that's going to fed over and going to be done internally by our IT people who are going to put all security measures in place. Something in concern will be it done through another entity or an organisation that filling in details and forms from people." (CAC1)

As mentioned in the literature review chapter (See Section 2.5 Usability), providing a quality user interface for an e-service can play a major role in instilling trust among customers. So if customers are perceived that the e-service looks trustworthy, they are more likely to engage with the e-service and not opt to use other platforms like telephone. Also securing senior management buy in is crucial to ensure that project will be funded appropriately and that a true inclusive e-service is produced as a result of that. It is very easy to give in and opt for an ordinary e-service when there are financial and time constraints but as stated previously the benefit of a true inclusive e-service can surpass its constraints.

> "It has to be, it so much cheaper to anything with ICT, and people want to use. We cannot afford not to, and if you want to be meeting public expectation you have got to be using it. as a Local Council we've always been keen in mobilisation of our workforce giving our social workers tablets, a lot of is probably been an economic drive and save the council money as much as anything else we do not need as big buildings and everyone is mobile working and doing their assessment on their tablets on their car. We can get more out it. They do not have to do the visit and go back to the office every time." (CAC1)

One of the issues between the senior management and the project team was the higher expectations of the quality of the e-service by the senior management. The senior management expects overly elegant and inclusive design, while the project team wants to develop the e-service as soon as possible so they tackle other projects.

> "The management on the top wants this e-service as soon as possible, they want it to be top class but they gave unrealistic timetable." (PM)

From the senior management perspective, the project was well communicated with staff and design team. The time that were given to them to plan and design the e-service was mutually agreed upon. Implying that all delays and inadequacies were caused by the project team.

> "Before we began the project we sat down all the people involved in the project whether our employees, CCGs as well as our customers to discuss the changes and to confirm the duties for each participant […] I do not see how we are still talking about time management." (SM)

The senior management point is accurate, however these discussions were more inclining towards stating the requirements of each participant rather than discussing about the feasibility of the timetable and can be done in that timeframe.

> "It was more like this is what we have to do, figure out a way to do it! Which is completely unrealistic." (PM)

The drift between senior management and project team started with the timetable then expanded to disagreement about the design proposed. The senior management insisted that with the given timetable the project team should be able to create an inclusive e-service, however the discussion about what does an inclusive e-service means was very limited.

> "We were just been told that the Local Council wants to adopt an Inclusive Design strategy. But what does it mean or how can we know which is which was left completely up to us." (PM)

This initiated the need to investigate what is meant by Inclusive Design and more importantly demonstrate whether a design is inclusive or not. The 'us vs. them' state of mind is harmful to any project, and delays caused by the project team added insult to injury.

> "We have given them plenty of time to show us prototypes of the system. But every time they show us something it seems very small compared to what we had in mind." (SM)

While on the other side, the Project Manager claims that the senior management was only concerned about their image and little about the content's usefulness. Showing interest on demonstrating what they were doing with regard to the Care Act rather than improving the interaction and design of the e-service.

> "My manager what to put a paragraph on it along the line. This is what the implementation team are doing etc... people in Local Council aren't interested in what the implementation team are doing let alone people out there, what benefit other than trying to make her feel good about herself and her role. The people aren't searching for that information. Yeah it makes us look good but nobody is going to read it. It is more like an education of our people and how to use and what the tools are for." (PM)

The issue with the mismatch of expectations is situated in the Senior Management inability to state specifically what they require in the e-service, which leaves the project team in problematic state

where they have to come up with ideas and implement them in hopes that they fit the Senior Management's vision and then modify them after each meeting which is time consuming.

> "The problem is they –Senior Management- do not know what they want exactly, they just talk about how they want an e-service that is usable by all and they want it ASAP" (PM)

On the other hand, the Senior Management have no way of evaluating designs in terms of inclusivity. Thus they would have to rely on the project team to explain how they ensured that the e-service was suitable to as many users as possible.

> "We have no way of proofing that the e-service is as inclusive as we hope." (SM)

The solution to this issue is to evaluate the e-service design using the Inclusivity Metric introduced in Chapter 6. The Metric would provide point of reference to Senior Management and Project Team during the discussion of about how inclusive is the designed e-service.

## 5.4 Inherited Design Flaws

This theme is comprised of three subthemes that collectively demonstrates the issues that revolve around obstacles from inherited design flaws. These flaws are mainly caused by trying to make the new system behave exactly like the old system, the Council's inability to define a universal theme for the website, and the lack of control over the page management. These flaws hinder the full implementation on and inclusive e-service by prioritising other issues than user needs.

### 5.4.1 Legacy System Alignment

The major struggle that haunts the implementation of the Care Act is shift from legacy systems and their flaws. The Local Council was keen on having an online presence so it can catch up with other Councils. There wasn't a clear strategy of designing the webpages, it relied the webpage designer preference. This has created inconsistent pages that differed in their navigation scheme and page layout.

> "It is ad-hoc at the moment. I mean I do have a list of authors and I send out recently to all the authors for some it is on the top of priority list for others is on the bottom. And yes there isn't a guideline. And because I do not have service directory authority I can beep people up for not doing it. Which one of the things we've got is able to do. we've got to be able to say 'sorry but it really isn't good enough it is got to be up to date' so I've got to write a report on keeping the website up to date and one of the things I'm going to put I n. because there's not point of having a website that we all work to March to get up to date and by June no body id thinking about it again. So the ongoing maintenance of it is going to be quite a challenge." (CAC3)

> "The directory of services was something that was happening before the care act came into force. But it wasn't as coordinated. I think the care act helped to kinds coordinate it more. But there was a move towards and commitment towards doing that it was probably more financial commitment compared to before as opposed to a political commitment." (CAC2)

### 5.4.2 Universal theme

The lack of unity in the Councils webpages has also been voiced by the Digital Team Manager, who stressed that these different styles are one of their biggest difficulties as they try to unify and upgrade their website. She also pointed that the way to resolve this issue is change the design strategy to an inclusive and user centric strategy that starts form the users' needs rather than what is convenient to the designer.

> "In terms of visual presentation, it is very much bespoke the page depending whose built it. What the actual layout of the page and how the navigation is there. We know that we have a problem and we've got different navigation schemes. We got quite significant problems to overcome really. We got to try and do that and meet the needs of the care act while we are working with this project as well. We have some of the work is coming from digital first other bits of it will be from the care act. We are taking a far, more user centric approach that requires a lot of user research." (DTM)

There are few initiatives to bring these different styles together, and work with user-centred approach. This was planned by incorporating users' input in the overall design. However, so little was done to involve actual users. The council just relied on their workers to test the system, and these workers are well aware of the requirements of each step and how to navigate in the system.

> "We've got a council for the navigation scheme. So we are working with them to develop the customer journey so we are doing a lot of work around the care act. like who are the people that will be doing things journey some of that I think the care act is still kinds pulling together some so are still in the

discovery phase the interaction and design in terms the needs from different audience and testing it and making sure that, the page of the way that people get to the page. So we do not repeat and problems that happened in the past." (SA2)

"So it is far more user based that sort of take. with real users as well not just that staff, of course the opinions and expertise will be taken into account, like the call centre agency and specialist group different levels of managers skilled." (DTM)

### 5.4.3 Proliferation Management

While the majority of the departments of the Council had created webpages for the services they offered, they often neglect to update them. As if the main goal is to just publish their services online. No proper care or policies have been in place to ensure the timeliness and the accuracy of these pages. The Care Act Consultant had shared her constant frustration with page authors.

"Maintaining websites is like maintaining a farm unless you keep going out there and feeding the pigs it dies […] the links break the references die, and the whole thing just falls to bits because you do not do anything with it." (CAC3)

When asked about the reason why these issue still persists in the Local Council's website. Fingers were pointed at different directions. From the non-IT workers' perspective, it was the IT department's fault. While the IT department blames the high demand and high turnover rate of their web designers. Placing more emphasis on the lack of proper knowledge transferred between the IT department employees.

"That what happened to us when the Communication Team went. The guy who left the team said 'the people have seen the swan floating on the water, and thought that everything was fine, and have not seen the lake going underneath. So they shot the swan' and it just sat there and our internet site sat there until last Christmas so for three years nobody has looked at it. All the information was out of date and I could not bear a minute longer." (CAC3)

"I think the site, most councils have had a website, since 2004 which when central government sort of mandate the website. at the time we were all mandated the same navigation scheme at some point that mandate changed the navigation schemes and councils have done that, and I think ours has been changed […] I think they've changed the navigation scheme here serval times, but never actually replaced one so they just added an additional one and put somewhere else on the page and I think that's the problem with the site as whole at the moment is that it has organic growth with very little management in terms of actually taking things away." (DTM)

When asked about the reason why such page growth has occurred, The Digital Team points that some of the things published in the website are not even necessary and just published just in case customers wanted to know about something which resulted in the website looking bloated.

"So the site is really big at the moment 7500 pages which is massive and we got 500 services and that's a lot of content even for quite complex services, there still quite sort of rationalisation and reduction exercise that needs to be done as how much of these content does not need to be there anymore.

How much of it is. it is almost like vanity publishing (or just in case publishing) we had an approach where I'll publish something just in case someone one day might want look at it, and then I forget about I do not need to think about it. Never update it... and actually there's no real user need for that to be there. It is not something we get asked for particularity frequently or have a big audience." (DTM)

However, she feels optimistic about the way things are looking as the Digital Department are taking more serious steps to "cut the fat" of the website; by reviewing the content of pages before they get published. This will increase their work load and introduce new bureaucratic steps but the outcome should outweigh these difficulties.

"I think so there have been some sort of maturity in Digital – Department- in the last 18 months where people really started to question that thing and certainly the approach government digital service where gov.uk kind of strengthened that and became an example for local government, to say we need to start with user needs and that's significantly different to how we've worked in the past and actually that might be slightly uncomfortable in some ways, because we have to take different decisions about what we do and do not publish or the way that we publish it and the way we manage it once it is actually there." (DTM)

On the other hand, continuous strides have been taken to ensure that the content as well as the layout of the webpages is up to date and unified with the universal theme that will be introduced with the Care Act forms. The Digital Team Manager has clarified the steps she and her team took to combat this issue.

"Will be on a rolling process of 6 monthly updates which are what we currently do for my other directory that I manage. So might be able to add in the list of authors and those updates along with the other updates. What I currently do to side manage we send an email out and we send another one a month later. If we still do not receive anything we send a letter or a phone call. Depending on what contact details we have. If there's still nothing they are suspended until they have it up to date. So in some cases having no information is better having out of date information. This will increase the frustrations." (SA2)

This raises concerns about the current view of ICT in the Local Council to whether ICT is valued and strategic asset or just an operational tool. Being able to identify the value of ICT and the importance of keeping correct information to the public should communicated throughout the Council and not just be left for the Digital Team to handle. Thus creating a shared responsibility of the content and maintenance is crucial to maintain a buy in from all staff.

"I think it is just starting to get recognised […] I think it is viewed an important pillar in theory. It thinks there's some sort of idea that somehow electronic information keeps itself up to date. That you set up a website and then it takes care of itself. […] I'd say in the last 6 months. It became a priority with the care act coming in. and then all the sudden they realised 'actually is that these people who do this work are valued asset' and having this information right and having someone who knows how to do it. And I think it is only been recognised. ICT was always there and it was fine. It was in the back of people's

mind whereas with the care act coming in, our information advice runs throughout the whole thing." (CAC2)

Likewise, one of the Care Act Consultant echoed their appreciation of getting updated webpages. This would make their job a lot easier when responding to social care requests. The out dated pages of the previous website are a real challenge to be overcame as it puts the integrity and the quality of the information provided in website at risk. Thus the reinforce customers lack of trust from the Local Council.

"We really appreciate if the information is up to date. One of the reasons is that we are being left in a situation where the policies are out of date, and you've got to then try to defend your practice on the basis of out of date policy […] so we do not have to spend all morning try finding something that can find in 5 minutes. So I get them to engage with me so that I will advise to whether or not we got a policy […] they need to know where they can find it and they will find it. And it is the same with the forms. If the forms are all there and easily laid out in the standard letters they can just find them and use them." (CAC2)

"When you look at our Local Council website even our digital team think it is appalling at the minute. With very old information on it and unused people do not understand what use them for, as we have a care act page put on the internet and what I would like to see on that it is got answer the questions people are asking how this going to change my care is going to cost more money." (CAC1)

The severity of out dated information on the council's website was stressed during the discussion about the previous website deficiencies. Clearly, the social workers we struggling to keep up with changing legalisations. This has resulted in the advice given to customers being inconsistent and highly dependent on workers' knowledge.

> "Regardless who are on the phone or how you're getting that information. It is not going to be right if it is not right. Or you have people with books their desks so depending on which advice you get on which day. You will get a different set of information. so you need one consistent set. This makes sense. and its why you cannot have things up there or even the smallest details like you have the carer strategy is from last year instead of this year. The minute you see that and you see its date 2013. You know that this website is out of date. You cannot have latest news since December 2012. Take it off. Because that immediately makes you think that the whole website is rubbish. Not that just this small of information is rubbish but the whole thing is. And so I go through in that sort of detail." (CAC2)

The inability to ensure that the information on the website is up to date can also affect the workers' performance as well as increasing the possibility to enquire about certain information on the website. Thus ensuring the integrity and timeliness of the information is very important to reduce the workload on the staff.

> "I think it is finding efficient ways to work as well. I think there's a recognition that if you have out dated information on your website and you customers service centre staff are either using that or people are looking at it and not finding the information

they need. Then they are ringing the customer service centre which wastes time because if they can find what the needed on the website they would not have to ring the customer service centre. So I think efficiency is driving their need to keep the information updated." (CAC2)

## 5.5 Simplifying the Interaction

This theme covers the discussions about simplifying the interaction in the e-service, while Inclusive Design spans more than process simplification. This theme serves as starting point to discuss the relevant issues with inclusive design, as stated in the Literature Review Chapter Inclusive Design should be treated as design philosophy that looks at the interaction of users and system as a whole instead increasing font size and providing screen readers. But first of all, insights about the design team understanding of Inclusive Design must be illustrated. This will help to showcase the value of Inclusive Design to the Council, and more importantly how they perceive it can be achieved. The second subtheme highlights their perceptions about optimum ways to handling mistakes committed by customers. As this issue should be considered carefully to not discourage customers from using the e-service and opt for other means communication. The third subtheme highlights the challenges by the team to select the words the best explains and reflect what is required from customers especially since a lot of the terms used are context specific and difficult to understand for a person who is new to the terminology. Finally, the fourth subtheme deals with selecting the appropriate data collection method that does not result in errors or confusions.

### 5.5.1 Defining Inclusive Design

This theme has been pointed out while interviewing participants about their views of inclusive design. While the majority in the project team acknowledges the need for an inclusive e-service than enables

as many customers as possible to interact with the Local Council, they differ on how they would define what is meant by an inclusive design. One of the Care Act Consultant pointed that an Inclusive Design should be simple and easy to use so customers do not have to call the Social Workers.

> "I think simplifying it completely is the way to go. We've got systems in place where I can take over that registration because currently I cannot do that, I can upload people's details to one our sites. So can do stuff for people if we needed too. We are obviously not relying on that because it is quite costly and time consuming. But we can do if we need to. It takes work in the first place to set it up but once it is in there and its right it is a lot easier to maintain. Then hit and miss for stuff that isn't right in the first place. So for initial outlay it should be less time consuming." (SA2)

However, in order to simplify the interaction, it was suggested that a great amount of information have to be removed so it does not overwhelm the customer with options. While it is also recognised that the e-service will not just be offered for older adults. This e-service will be used by other computer-literates who would assist their friends and relatives to register their information and request other services. Thus a balance of sufficient information and simplicity should be sought.

> "It is not just for older people. We've got to focus it on all citizen of jurisdiction whether they are in the need of social care now or in the future or just wanting to access a county park or house serving services. It is got to be for everybody not just older people. On top of that it needs to be used by staff, like if they are searching for service for somebody, or if they are talking

with a library or GP surgery, it could pick up for those people as well. So basically it is for everybody and anybody, from 18 up, because we have a separate one for children services" (SA1)

To overcome that it was suggested that the e-service starts with asking introductory questions, to allow users to select the conditions they suffer from and then go more into details about the conditions requirement. For example, if a person selects mobility problems at the first page a new tab about the mobility problems and their extent will be displayed so the customer can only respond the relevant questions. Thus preparing the customer about what is required in the coming pages.

Moreover, the issue of how the council can decide which design is more inclusive than the other. Given that there are a lot of design guidelines and it is difficult to judge which of these guidelines can offer more intuitiveness to the proposed design. The Digital Team Manager shared her frustration in that regard.

"Councils will still go of as 180 and so local authorities and probably there will be 180 interpretations of exactly what 'good' looks like." (DTM)

What is equally important is the need to recognise the needs and the issues that hinder usage among older adults. As this age group differ in their capabilities and ICT acceptance. The Digital Team Manager pointed at an important aspect in the way that some older adults have interacted with the council and the way they address the issues they would like to resolve during this interaction. She suggested that customers aged 75 and above tend to talk around the issue they called about, as way of social interaction.

> "There different age bands in what we class as older adults, towards the top end of that 75 and over. They suffer social isolation type of problems, as well as being more used to picking the phone. When asked people who worked at the contact centre a lot of people who ring up from that age range they actually tell a very long story, where the thing they ring up about they can tell you in 2 minutes but they explain around it. because actually they just want to have a conversation with somebody and that might be the only interaction that they are having with somebody that day, and it tends to be a lot chattier than it would be if was just a transaction." (SA2)

On the other hand, she pointed out on the variance on technology acceptance among the younger band of older adults. Especially since some of them have experienced with ICT when they were working. While others are still hesitant about trusting ICT to conduct sensitive transactions.

> "55 to 65 there's a real difference you got more polarity within that age range of people very comfortable with technology, with things like kindles and tablets, they got them from their children and they used to keep in touch with people or to amuse the grandkids and find things to do, and the other side who more like traditionally based perhaps they got a bit of suspicion about online and about the privacy of data." (SA2)

Regardless of their ICT readiness and acceptance, e-services should be designed in a way that does not disadvantage customers with disabilities. Allowing customers to have the choice about the platform they wish to conduct the service in. Public and private

entities should invest in encouraging older adults to user e-services by showing them the value of such interaction.

> "I think perhaps it is habit as much as anything else, that they perhaps they have not seen the benefit that people in the younger age group that's its actually better and more convenient. But if they are heading towards retirement then doing something a 10 at night does not matter because they've got all day to do it. That was I got from the customers that we got. They do not have a real pull to do it. Some of it might be due to disabilities and limitations that come with ageing also there's the issue around access whether they have access to a computer or the internet at home. I do not think it is one reason I think it is a whole combination of reasons." (DTM)

One of the obstacles that affect the creation of this inclusive service is balancing the shift of requirements between users, staff, legislation, and legacy systems. The Project Manager points that the implementation process has changed for this project to balance these requirements. Suggesting a unified approach for all service platforms so future, however this approach needs careful analysis of the procedure to evaluate whether each step is necessary or redundant.

> "I think previously the way that this would have been approached, is that you have a separate process for the call centre and another web self-service, and partly because of the technology we had available so both of these processes would be pretty static where now we are using a new tool which can be used in both scenarios and provide the services in a logical way. Which means that you can make the online form a lot more intelligent you can ask questions when it is appropriate. The kick back from that is that CSC in the call centre who is

using this form does not need same level of scripting as they previously needed." (PM)

On the other hand, the Digital Team continues to embed their user-centred approach in the Council's practices. While this approach is important to when designing inclusive e-services, it is not always feasible to incorporate such practices, especially when there are a lot conflicting requirements for a given task.

"The organisation has adopted the government digital services 10 design principals. the first one of which is 'start with the users' needs' so I think anything that comes along with the service whether it is some change of statuary liability like the care act or whether it is a different way of producing a service is really the early stage as they start to think about it they need to make the digital team aware of it to really help the solution with our expertise right from the start." (DTM)

Adding this task on the Digital Team will sure bring resistance as the procedure to publish services or pages on the Council's website will be longer and more complex than before. However, this is necessary to control the website proliferation and ensure a consistent navigation scheme is followed throughout the website.

"I think the other aspect that we bring we are almost like a critical friend in some cases we are the users advocate and we do challenge some of their thinking and perhaps we ask the questions that they do not want to hear […] Certainly with other services we ask questions like we could make the process a little bit better we could make this more efficient or make it easier for more people sometimes it is not the service that you

will be delivering it is more about fundamental questions a deeper change for the council." (DTM)

However, for the observations in the task force of the Care Act. The involvement of the Digital Team was limited. The representative from the Digital Team did not engage or even challenge the design choices which clearly violated the navigation scheme proposed by the Digital Team. During the monthly program meeting in the council the Care Act implementation project received harsh criticism about the low compliance with the council's navigation scheme. This places more emphasis on creating awareness throughout the council.

### 5.5.2 Error Handling

Within the interaction simplification theme emerged a very important subtheme that focus on error handling. Considering the length and the complexity of the e-service the proper error prevention and detection mechanisms should be put in place to improve the customer journey while filling up the forms especially since they are uploading sensitive information throughout the interaction.

"It has to be handled with care, as this information provided is important and sensitive" (PM)

While everyone in the design team acknowledge that mistakes will happen during the interaction with the e-service. However, the problem is how to determine the optimum way to prevent these errors and detect them.

"Mistakes are unavoidable with our lengthy forms. They need to make sure where they made the error and how to correct it" (SA1)

"We are struggling to figure out the best way to detect errors as the majority of the input fields are textboxes" (SA2)

This problem has not been a big issue before since the people who fill the forms are expert social workers, who are familiar with the process and who possess high levels of computer literacy. This was voiced by the Project Manager when asked about how they dealt with the issue before.

"Previously social workers fed the information to the system, and they know what to put in each field because they have been doing it for years […] now we are letting customers to do it by themselves who are first not familiar with the terminology and second the might get frustrated and call the customer service centre which defeats the purpose." (PM)

When asked how the design team would mitigate this problem, a varying solutions were proposed ranging from error prevention to error detection and correction.

"We have to anticipate where the customers would commit an error and the try prevent them from doing that error in the real transaction" (WD1)

"We need to make it clear what is required from each question […] We can add an example of what to input in each question. But that would bloat the page, we need to make the screen as clear as possible so it does not become overwhelming" (SA1)

The debate among these designers have helped tremendously to shine the light on the importance of handling errors as reflected by the Project Manager.

> "We need to make sure that users know exactly what they need to put in the answer for each question. So they do not give up and end up calling the Call Centre folks." (PM)

### 5.5.3 Terminology Selection

This emergent theme discusses the issue around selecting the appropriate terms to convey information to the public easily. The challenge here is that the context is very complex and requires knowledge of the requirements to request social care services from the Local Council. A Social Worker echoed the importance of choosing the terminology wisely to ensure that the e-service requirements are understandable by customers.

> "If we do not get it right. Making the terminology not right for people to do themselves, given that we use health and social care terms. Getting the information on the website and making sure it is categorised, so you easily find stuff and navigate." (CAC2)

On the other hand, another Social Worker expressed the difficulty to dilute the terms as Social Workers are immersed into the field and might find it difficult to remove themselves from their job titles and think of alternative ways to ask a certain question.

> "For us it seems very easy, but we have to put ourselves in the customers' position. They will probably struggle with understanding what we want from them so have to tell them

precisely what we want and how would that effect their application." (CAC1)

The Project Manager also commented on the project team immersion in the field terminology. He argues that the reason for this difficulty to step back and look at the big picture, is the strong reliance on previous systems. This reliance manifest itself even in the way the team calls the e-service.

"Since the beginning of the project we kept calling the our online forms 'Contact Forms' just because it was called that in our case management system. 2 weeks earlier we were thinking of what we should put on the title section, and we had an epiphany that the 'Average Joe' won't recognise that what he's doing is creating a contact, he's requesting social care service so we changed that." (PM)

A Social worker acknowledged the problem of heavily relying on system's terms. Especially since they tried to mimic the terms used in the previous system without evaluating them in terms of how understandable they are to the customers.

"We got used to the previous system and I think there's some spill over in the new system that we're making." (CAC3)

While the User Interface Designer pointed that the problem selecting the appropriate terms stems from the not involving customers in the design process. Thus relying completely on expert users who already know what the process entails. This affects the inclusivity level of the e-service as it will be design by the expert users and for the expert users.

> "The problem resides in our inability to involve real users in the design process of even conduct user testing for our prototypes." (UID1)

With the absence of user testing, a lot of insights about the e-services and its easiness to understand will be missed. So when asked about the way that terms are selected, the Digital Team Manager responded that it is merely guessing what seems appropriate.

> "We have to do some educated guesses on what sounds easy and what not, which sometimes might not be successful as we wanted." (DTM)

Of course, this will not result in how understandable the terms used in e-service. So the team needs a more robust approach to accomplish that. Another User Interface Designer voiced the necessity to overcome this issue. Since the design team presumes that everybody has the same understanding of the social care process.

> "We have to first overcome the issue of designing for ourselves. We have to recognise the diversity of customers' cognitive and physical abilities" (UID2)

A solution to this issue will be introduced in Chapter 6, where the Inclusivity Metric will be discussed. Showing a method to address the readability of the e-service.

### 5.5.4 Interaction Methods Selection

The last emergent theme is concerned with selecting the appropriate interaction method. What is meant by interaction method within this context is selecting the suitable data collection element

for the interface (e.g. drop down lists, textboxes). Previously, the Social Workers were in charge of filling out the forms for the customers so they got used to filling the textboxes with each condition that the customer got. However, now it is given to the customers to fill it up by themselves.

> "One of the issues that we had from our previous services, is that we relied so much text entry which gave us a wide range of diverse answers." (CAC1)

Moreover, the selection on interaction methods affects the format of the questions asked. Especially since an open question requires a textbox where customers can freely describe their condition. So moving to another format like multiple choice options requires investigating the possible answers and then list them. The 2 User Interface Designers explain.

> "We decided to change the format of the questions so they can be answered by radio buttons as multiple choice options." (UID1)

> "We had to sit down with Social Workers to try reduce the answers to limited options. This of course will limit the opportunity for a person to elaborate, but we decided to and a textbox at the end to allow users to talk more about their cases at the end." (UID2)

However, ordinary questions like Date of Birth is deemed more problematic while trying to improve inclusivity of the e-service. Customers who are not familiar with typing in a textbox or using a date selector, might find the whole interaction difficult and perhaps give up and leave the entire e-service. The System Analyst describes

who they decided to implement the Date of Birth selection mechanism.

> "Date of Birth was big trouble as it requires different methods of interaction. Initially we thought of one single textbox labelled by the acceptable Date of Birth format DD/MM/YYYY. But then we collectively decided to make as 2 drop down list for day and month, and textbox for the year as we anticipate older customers and a dropdown list would be troublesome for them." (SA2)

The Project Manager also stressed on the importance of considering customers who are not familiar with computers while deciding the optimum way to gather the required data. So thorough consideration of the options available to gather data is necessary to insure that the e-service is easy to use by the majority of users.

> "These user interface elements are taken for granted by experienced users. However, they can be a real pain for novice users especially when they have to scroll to view options." (PM)

## 5.6 Analysing Themes

This section is divided into three subheadings which reflect them the main themes. At this point analysing these themes that demonstrates the challenges faced by the Local Council during them pursue of adopting Inclusive Design strategy to attract as many customers as possible to their online service. This lays the foundation for the next chapter which shows the proposed solution which also reflects the Action Phase and Evaluation Phase of the Action research cycle adopted for this thesis. FiguresFigure 13,Figure 14Figure 15

show the cross-relationships between themes which will be discussed in further details in the coming subsections.

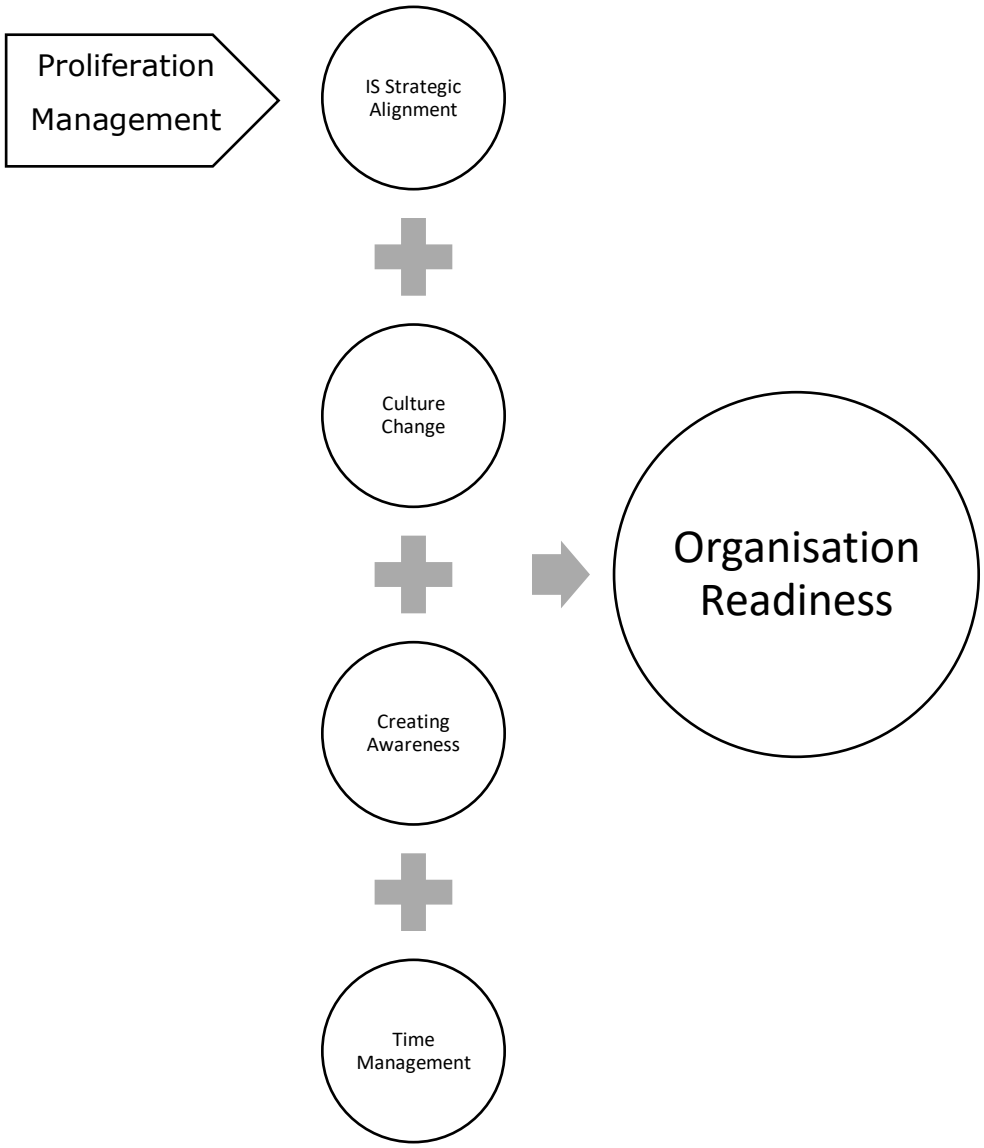



**Figure 13 - Themes cross relationships (Part 1)**

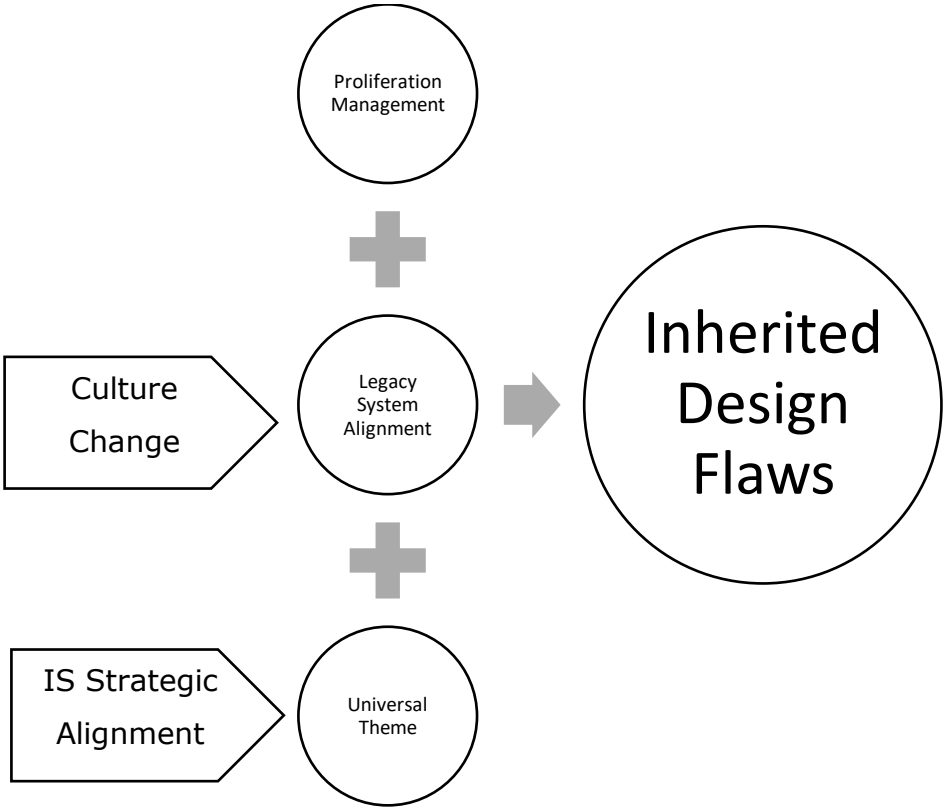



**Figure 14 - Themes cross relationships (Part 2)**

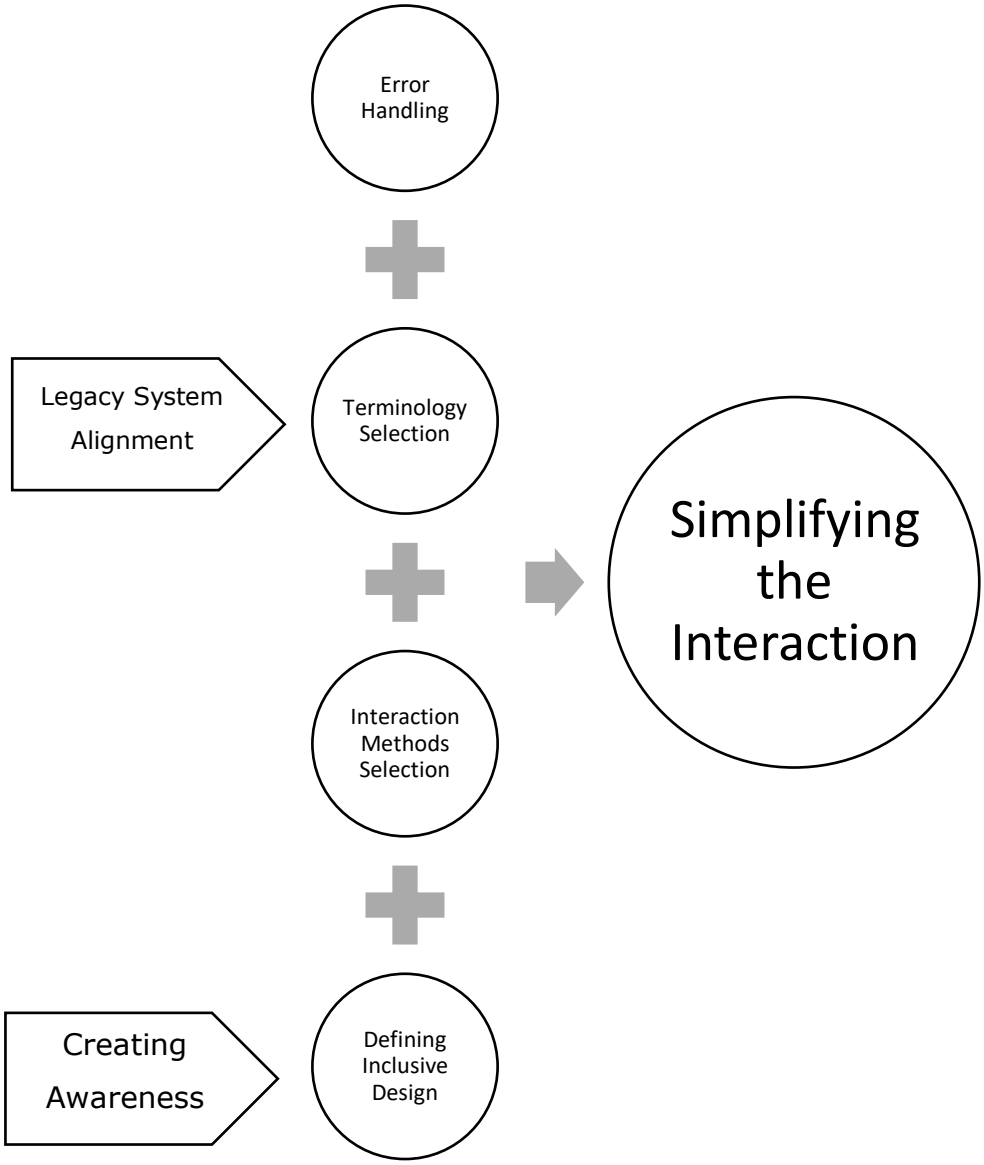



**Figure 15 - Themes cross relationships (Part 3)**

### 5.6.1 Organisation Readiness

Within the Organisation readiness theme, the subtheme 'Cultural Change' was the most frequently brought up topic by the research participants mentioned by the majority of these participants. This is understandable as the Care Act will bring changes to the role of Social Workers in the Local Council, transforming their jobs from mainly bureaucratic and repetitive tasks to tasks with more analytical capacity. Not only their jobs will be changed but also the way that the Local Council perceive their online presence. Moving towards a keener way to approach their customers whether in the way they present information to them or by or the way customers are encouraged to engage with the county online. This change in culture is necessary to effectively adopt an Inclusive Design strategy that allows users whether young or old to use their online services. Following through with this cultural change and paving the way towards inclusive practices and truly relying on ICT to provide services in key to bridging the age-based digital divide between users and non-users of ICT. More importantly the discussions around the cultural change revealed that the employees were eager to implement these changes and the resistance to such changes are not likely to hinder the progress of Care Act implantation nor will it change their perception of value that ICT will bring to the Local Council. A small hesitation can be sensed from some the research participants; however, this hesitation comes from uncertainty rather than fear of ICT. The hesitation is to whether this solution will deliver its aspired goals, and whether this implementation will be as beneficial to customers and employees as the senior management promised.

Following the 'Cultural Change' subtheme, is the 'IS Strategic Alignment' was mentioned by a lot of the research participants too by less than the previous subtheme. What is interesting here is that most of the research participants who work in social care were unsatisfied with the current state of the online services and IS. While the participants who work in the IT department lightly defended their practices stating that if the Senior Management had more faith in ICT then they should invest more in it instead then subjecting them to constant budget cuts. This is a classic Business/IT divide, where the business side do not recognise the value of ICT and only look at it as operational tool rather than strategic asset. As stated above in order to truly bridge the age-based digital divide and adopt Inclusive Design practices, the organisation needs to have a true commitment to ICT. Whether in terms of budget allocation or encouraging staff to utilise their ICT tools effectively, ICT should be looked at as strategic tool that can enable the organisation to have competitive advantage to flexibly achieve customers' goals that will in turn improve the organisation's reputation among its customers. This is important since all indications show that the Council is going to receive large number of requests and only with ICT will the council be able to process these requests while maintaining low costs and high efficiency. Only when ICT is truly recognised as strategic asset from the inside, then it will be manifested in the council's practices and online presence. Another important issue to address while looking at the 'IS Strategic Alignment' subtheme is its relationship with the 'Proliferation Management'. In the 'Proliferation Management' subtheme it was noted that the reason that the webpages have increased dramatically is because there were no guidelines or management that address how and why pages should be build. Letting people publish webpages just for the sake of having a webpage. The absence of such guidelines is alarming, and indicates that there's no strategy to effectively use the Internet to disseminate

information to its customers. By publishing pages just in case some needs them, can cause the website to be messy and confusing. All of which reduces the website usability by ICT novices and people who are not familiar with online services.

Another subtheme that was mentioned frequently by research participants was the 'Time Management', with participants coining it as main challenge to the implementation of inclusive e-service. The main concern when it comes to time management is being proactive in implementing inclusive e-services. This is done by allocating time to properly implement that e-service, opposed to design a 'quick and dirty' webpages that covers the basic functionality just for the sake of having the service be up and running quickly. The majority of the research participants pointed out that they do not want to repeat previous problems by just focusing on having a webpage rather than having an e-service with good quality. Going back to the comments in that subtheme, providing an e-service that does not meet the Inclusive Design principles will more likely result in more work on the shoulders of social workers and the IT department as well. This is due to the complexity of the process thus any vague wording or unclear data field will result in the customer giving up and calling the Council which is counter intuitive. The more time spent to design and evaluate the e-service the better it will perform once gone live. The project team suffers from unrealistic timescales which the senior management has put in place. However, Inclusive Design requires more time to be allocated at the beginning in order to achieve the desired results. Especially since adopting Inclusive Design requires understanding the users' capabilities and how the users interact with the system, all of which facilitates and truly inclusive service that looks at the population as whole and does not overlook certain users.

Finally, the least mentioned subtheme which is the 'Creating Awareness'. Considering that social care is not a popular topic amongst the customers in the Local Council, due to the associated negative stigma. Moreover, the Council is not considered as main source of information with that regard. This requires the Council to first demonstrate itself a reliable source of information that customers can depend on with they look for social care services. On the other hand, internal awareness is equally important, in which employees have the correct and updated version of the regulations so the advice does not differ from employee to the next. However, awareness is not a major challenge to Inclusive Design as it only affects the employees' and customers' effectiveness.

### 5.6.2 Inherited Design Flaws

The design flaws that has plagued the Local Council for a long time has been discussed in length while investigating the challenges that hinder Inclusive Design practices in the Local Council. The subtheme that was mentioned less frequently within this main theme was 'Legacy Systems Alignment' this subtheme uncovers the underlying dependencies on previous systems. Even though its effect was obvious in the design sessions later on, but the interviewees barely mentioned it due to their unawareness that they had been readjusting themselves to the previous system. This ultimately forced the design team to follow the system's requirement instead of the users'. This is a major challenge because Inclusive Design encourages designers to look for better ways to allow users to engage with the system. However, due to the prior commitment to case management system that handles social care requests the entire process has been restricted to following the procedure that the case system use. Thus limiting the designers' abilities to create inclusive e-services, especially since addressing users' needs is one of the main pillars of inclusive design. The legacy system dictates the type of data to be

used and how to collect them. Inclusive design focuses of changing the design philosophy to consider the population as whole, dwelling on their needs and aiming to provide the necessary features to make the interaction as easy and accessible as possible. Another important thing to look at while analysing the 'Legacy Systems Alignment' subtheme is its relationship with the 'Cultural Change' subtheme. When the interviews lead to discussion about the dependency on the legacy system is was usually followed by discussions about the need for a cultural change in the way the Council designs new online. It was evident from the discussion that the council needs to change its approach instead of just interfacing their systems online. Given the complexity of such systems the interaction between customers and the council is going to be difficult and unpleasant. As stated in Section 4.6 Data Analysisthe absence of mentions to a certain issue within the research context can provide insights on the problem to be investigated.

Moving on to the second subtheme covered by few of the research participants. Which is the absence of a universal theme, the current state of the website of the Local Council is not favoured by neither the social workers nor the IT staff. There's a consensus among the employees that the theme of the website is bespoke to the needs and sometimes the abilities of the designers. These variations range from different colour schemes to different navigation schemes. Having an inconsistent interaction across the same website sends a message of unprofessionalism and more importantly it leads to confusion from the customers' side. The Care Act forms template in terms of interaction and design will be the main template that will be used across the website. This will be done along with a trimming exercise, all of which will help reduce the challenge of theme inconsistency and enable the creation of a true inclusive design.

The third and final subtheme in this main theme which is 'Proliferation Management' was mentioned by a lot of the research participants. This subtheme highlighted on of the issues around IS and its importance in the Local Council by showing how webpages are created with minimal maintenance. Webpages that date back to 2010 that has not been updated bloat the website, and make the interaction with the website challenging if a person is a novice or who has physical disability. While it has been mentioned that Council's website has been put through a reduction exercise where unnecessary and dated webpages are removed, it still suffers from lack of management. The Digital Team is eager to inforce a rules to ensure that pages are well kept and updated. This will also help to ensure that the webpages cover all the inclusivity principles to allow users with different capabilities to engage with the Council's website freely. As stated earlier in the 'IS Strategic Alignment' subtheme, ensuring that pages are there to convey valuable information to customers is key to enable the Council to serve their customers effectively and efficiently. Especially since having a condensed website will hinder the interaction of customers with disabilities or novices who are the main beneficiaries of the Care Act.

### 5.6.3 Simplifying the Interaction

This main theme was focusing on issues with the interaction with the websites. Looking at the optimum way to allow as many users as possible to interact with council's website without compromising the integrity of the information. However, it was obvious that there is no consensus about what is meant by Inclusive Design amongst the design team. So in order to know what is what Inclusive Design entails for the council it was necessary to collectively agree on a definition of Inclusive Design through comparing and contrasting the design team definition with the definition from the literature. What was interesting is their consensus that Inclusive

Design meant that information and interaction needs to be simplified. This covers a rather narrow definition of Inclusive Design but it is still a promising start towards achieving the goal of designing inclusive e-service. However, Inclusive Design entails looking at the population as whole while designing things that will be used by people with varying conditions as well as varying environments where they will use the e-service with the current increase use of mobile computers and smartphones. There is a recognition that in order to build an inclusive e-service the design team need to consider the needs of the users which is the core of all design strategy. However, it is easier said than done especially since more emphasis has been put to satisfy the system's needs instead of the users. This was evidenced by the lack user involvement in the design process. While the design team has claimed that they will conduct user testing at the end of the design phase to test the service compatibility with users from all walks of life. However, in order to align the definition of inclusive with the definition in the literature, user has to be consulted and involved early on the process to provide their insights and help reduce rework once the service goes live.

The second subtheme in terms of mentions was the 'Terminology Selection'. This subtheme sheds the light of the complexity of the terms used in the social care context. Showing how terms should be selected carefully to first not convey different meaning than is intended, and second not to overwhelm costumers with complicated terms that can result in customers choosing to call a social worker. The main issue with the terminology selection was the reliance on the previous system's terms with little consideration of the real world context. Stepping back and considering what is the main requirement of each form and each question is important to ensure that the design is not just mimicking the legacy system. This also proves the importance of involving users early on, so they can

aid in the wording process. Especially since the design team members are experts in their fields and sometimes it is required to step down and dilute some the terms used to ensure that the questions are understandable by the majority of the users.

The third subtheme in terms of frequency of mentions was the 'Interaction Methods Selection'. In this subtheme discussion about the choice of input elements in the user interface, decisions on which input element is appropriate for a certain question are important to ensure that the interaction is simple and smooth for the majority of users. One of the main challenges of Inclusive Design within the Local Council was the need to ensure that the forms did not rely completely on text fields, which in turn would complicate the process for both users and social workers all the same time. Thus rephrasing the open question to closed ones that can be answered with a radio button selection instead of describing the conditions was one of the important tasks on the design team hands to simplify the interaction of the e-service.

Lastly, the 'Error Handling' subtheme, given the length of the e-service and the depth of the information required in each question. It was necessary to implement an appropriate strategy to prevent, detect and correct errors. This has to be done carefully so it does not annoy the customer. So the required information should be clearly marked, and the data fields should indicate the type of data required as well as the layout of these data. It is understandable why this subtheme got the lowest mentions from the design team, as these issues of error handling has been dealt with at length in previous projects as well as design guidelines. What is important is the implication of error handling to inclusivity. Considering the population as whole while adopting an error handling technique is vital to allow

users to perform the task without hesitation or worry that the information was given erroneously.

## 5.7 Summary

In conclusion, this chapter identified the main challenges of Inclusive Design practices on the Local Council. As stated earlier (See 5.1 Introduction), this chapter reflects the discovery phase in the Action research cycle. Which enables the researcher and the research participants to explore the issues within the context, to foster deeper understanding to allow solutions to be collectively developed and evaluated.

This chapter has organised and evaluated these challenges in terms in terms of relevance and importance to the research participants. The challenges mainly reside in 3 major areas namely, organisation readiness, inherited design flaws, and simplifying the interaction. Organisation readiness highlighted that there are deeper issues that hinder the implementation of inclusive e-services. These issues revolve around the Council's belief that ICT is valuable element in the Council's strategy. As this belief will manifest itself in the Council's willingness to put more resources when implementing services to be delivered online. Which in itself calls for a change in culture within the Council. For the Council to be ready to implement e-service that are inclusive of all prospective customers it first needs to assess the organisation culture and encourage its employees as well as customers to utilise ICT for better engagement and convenience. By creating awareness of the benefits of engaging online with the Council, highlighting the privacy and security measurements the Council took to ensure the smooth running of its online services, as well as the measurements the Council took to ensure that their service are compatible and inclusive customers so they do not feel left out.

Moreover, one of the challenges faced by the Council is the inherited design problems. This was mainly caused by their dependency on legacy systems, the inability to detach themselves from what has the previous system did and focus on what are the needs of the users is one of issues that hinder their Inclusive Design adoption. By focusing on what is important to the user, and changing the interaction process is key to improving inclusivity. However, limiting the interaction to what the previous system did and just imitating its process will not improve ease of use if the previous system is complicated. Also, the absence of a clear and unified theme for the Council's website is one of the contributors to inability to improve inclusivity. As some webpages are created with different navigation scheme with little oversight to ensure compatibility with the other webpages. Furthermore, the lack of oversight on the website development has resulted in a large number of webpages that are hardly updated, webpages that are created but has no use to the public and rarely visited. This "vanity publishing" of webpages ask described by the research participant, first lack the quality standards in terms of accessibility and consistency with the rest of the website, hurts the inclusivity standards as well as the organisation reputation.

Finally, the challenges about simplifying the interaction and making the e-service easier to use were discussed. However, there was a need to first find consensus on the definition of Inclusive Design among the design team. Thus, the design team was asked about what does Inclusive Design means to the Council and whether it is worthwhile for the council to pursue Inclusive Design practices. It was acknowledged by the design team that a formal measurement of inclusivity needs to be established to properly distinguish the criteria that makes am e-service inclusive. Also, to make the interaction

simpler 3 things need to be considered and implemented properly. The first issue is how the design team handles errors by first preventing errors and then correct them. The second issue deals with the complexity of the terms used and how to make them understandable by the customers who are not familiar with the context. The third issue was selecting the interface elements the improve ease of use and enable efficient data collection from customers.

All these challenges pave the path to the solution that will be introduced in the following chapter which will demonstrate how the Inclusive Metric was built and used to overcome these challenges that affected the Local Council.

# Chapter 6: The Creation and Evaluation of the Inclusive E-service in the Local Council

## 6.1 Introduction

In the previous chapter, the challenges of adopting an Inclusive Design strategy in the Local Council was introduced. Where the Local Council were trying to appeal to older customers and trying to encourage them to use their e-services instead of their other conventional platforms. This was done by trying to lower the technology barrier of the proposed e-service. The challenges from the previous chapter paved the way for the researcher to develop the Inclusivity Metric. This Metric is an evaluation tool that measures certain aspects of the interface and behaviour of an e-service to see how inclusive and easy to use this e-service to prospective customers whether old or young, computer savvy or novice. This Inclusivity Metric takes the important aspects highlighted in the literature that reduce the barrier of usage by user groups who possess low computer skills and older adults in particular.

In this chapter, the development of the Inclusivity Metric will be discussed. Demonstrating the importance of each construct of the Metric and its relevance to the literature. Then an evaluation conducted by the Inclusivity Metric for the e-service developed by the Local Council compared with an e-service that scored highly in the Metric. The evaluation of the Local Council's e-service was conducted by researcher and the design team and not with actual customers due to privacy concerns voiced by the Local Council. To mitigate that the design team evaluated the other commercial e-service that scored highly in the Inclusivity Metric, to form as a base of comparison between the two. The evaluation done by the actual users was conducted with the commercial e-service that scored highly in the Inclusivity Metric. To highlight the issues that fostered ease of

use and easy access by actual users. The users selected for this part usability testing were a combination of computer savvy users, and novices who participated in a computer learning course offered by charity in the University. Then the results of this evaluation will be discussed to show the difference between both e-services to highlight the areas of improvements that can be done in the Local Council's e-service.

This chapter reflects the Action and Evaluation phases in the Action research cycle, in which the solution proposed by the researcher is implemented in the context (As stated in Section 4.3). This phase is what distinguish Action research from any other research design due the involvement of the researcher in the research context and the researcher's aspiration to bring change influenced by the thorough appraisal of the literature to it and improve current conditions.

## 6.2 An overview of the Inclusive Design Implementation Lifecycle

Following the Inclusive Design lifecycle developed by Keates et al. (2000) (See Section 3.2.2 Inclusive Design) this section details the steps made by the researcher in collaboration with the design team in the Council to create the online forms for the Care Act 2014. In the initial meeting with the Council were the project was discussed, it was suggested by the researcher that the Inclusive Design lifecycle to be used for this project. This project was suitable for the Inclusive Design lifecycle because the potential user groups were going to be a diverse of younger and older users whether applying for themselves or someone else. Moreover, the Council has prepared some marketing material to encourage people who do not require immediate social care to proactively read about the new regulation and register their information if needed. The lifecycle was explained

to the Project Manager and he agreed that it was very similar to the design lifecycle they use in the Council and that they are willing to try out this design lifecycle.

The Inclusive Design lifecycle as shown in Figure 16 - The Inclusive Design Life Cyclestarts with the Explore Phase in which the nature of the transaction is discussed, issues ranging from the prospective users of the system, and the purpose of the system that is being created. In this phase a thorough analysis of the transaction is carried out to understand the process and ultimately optimise it to eliminate any steps that make the process complicated. The second phase is the Create Phase in which concepts are developed. Through this manifestation of concepts discussed in the previous phase prototype can be created to allow user testing to in order to deliver the final product. After that is the Evaluate Phase, in which the system is tested to see whether it met the requirements. The system is tested with a sample of perspective users to understand what are the areas that facilitated the interaction and the areas where improvements need to be made.




**Figure 16 - The Inclusive Design Life Cycle**

**Source: www.inclusivedesigntoolkit.com**

Throughout this cyclic process, the reflective appraisal of how each phase has been conducted is done at the end of each design session. This helps to view the big picture and whether the phases are going as planned. Also it gives the Senior Management a chance to see the progress of the project. As tempting as it to view this design lifecycle as a definite step where the start and the end of each phase are clearly visible, the phases in the design lifecycle overlap one another. Especially since some of the ideas were prototyped and then reimagined after consulting the rules of the Care Act. During the weekly design sessions, the Project Manager would lead the session by discussing the points that needs to be addressed at the full day design session. Finally, he would debrief on what has been done in the session and what needs to be done by the next session. Usually a prototype of what has been done is presented at the beginning to guide the conversation. These sessions we conducted in an open space in the Council where the project team can discuss their ideas and visualise them using the whiteboard provided.

### 6.2.1 Explore Phase

In the beginning of the project interviews were conducted with the design team to discuss the project and what needed to be done. Some of these interview data were reported in the previous chapter to highlight the challenges of implementing Inclusive Design practices in the Council (See Chapter 5: The Enablers and Disablers of Inclusive Design in a Small e-Government Context). This section focuses on technical and procedural requirements of the new e-service. In this phase, discussions about the perspective users are carried out to see what the needs of the users in details are. Then, exploration of the process and the possible routes that the users might take to accomplish the tasks required. Finally review of the process is carried out to ensure that the process in whole and carefully optimised without any compromise of the integrity of the transaction.

In the beginning of the project, the Care Act Consultants gave all the participants an overview of the changes that the Care Act will bring to the Council and the social care system in general. There was obvious enthusiasm from the Web Designer to start creating prototypes of the system evidenced by his comments questioning the need to go through the changes in the social care system.

> "Do we actually need to see all the changes in the Care Act? I think it is better if we start available system that we have and change the relevant stuff" (WD2)

Regardless of the designer's familiarity with subject it is crucial to look at the full picture. This way designers will not be carried away with aesthetics and leave the main requirements. The point to be taken, is that a conversation about the changes of the in the context needs to be carried out with all the project stakeholders. What really distinguish this project in particular is the Council's keenness to incorporate as many stakeholders in the design team. The Project Manager carefully selected key players from each department to first create buy in to use the system, and to diversify the feedback to capture more input.

In order to facilitate understanding among this diverse group, a map of the steps needed conduct the transaction was presented as seen in Figure 17 - Usage ScenariosThis enables the design team to envisage the process, and create alternatives to fulfil certain process. For example, there was a debate to optimum way to ask the users questions about their well-being and level of care they require. It was observed that the IT specialists did not think through of how complicated the task will become if the user had multiple conditions. It was pointed out by on the Social Workers that this issue will require

a lot of effort and time for users to answer the questions by themselves. Therefore, it was agreed upon that brief questions about their conditions will be asked at the beginning to allow the users to see what the nature of the question ahead for them are and to help them prepare for the questions that lay ahead. This also helps to customise the experience for them users so they do not have to answer questions for services that they do not require.

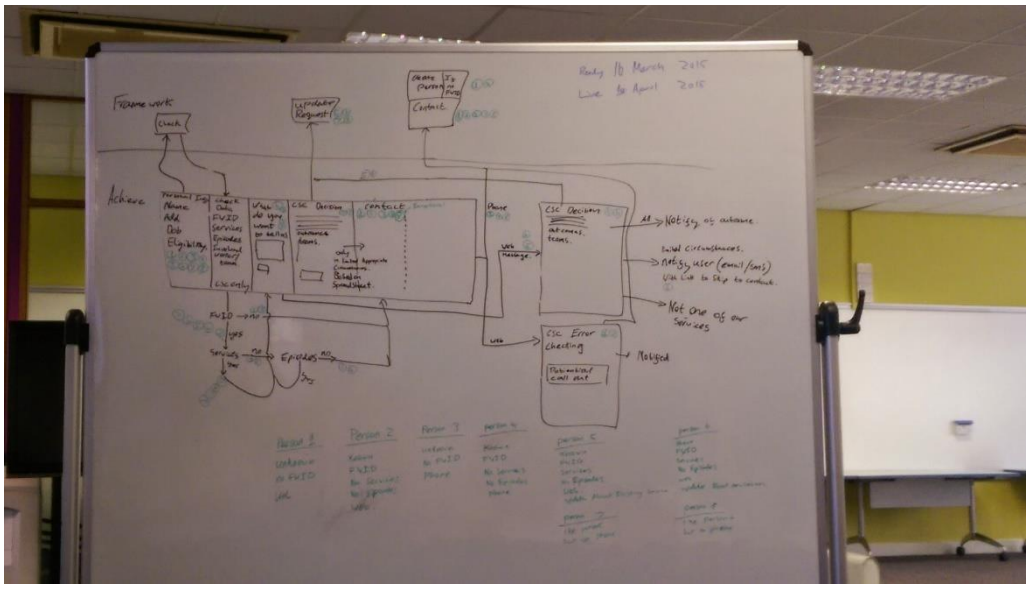


**Figure 17 - Usage Scenarios**

This phase was one of the longest phases of the design lifecycle, because it required a lot or coordination and agreement from all stakeholders so the e-service does not contradict the Care Act regulations. Moreover, a great deal of emphasis was placed for the wording process. However, this was all done using the design team. No consultation from actual users of the system was ever conducted. Even though it was suggested by the researcher but the Design Team could not involve users in in the design lifecycle. A quote from The Digital Team Manager to justify the decision was:

> "Since our social worker have a lot of experience explaining issues to the customers. So they would know which terms

would suffice in each question. As you know brining customers now would require a lot of leg work and that would need a lot of time, which the time that we do not have given the progress of the design." (DTM)

Social workers attended all the design sessions and they managed to simplify some the words used in the e-service. Moreover, they recommended alternative paths to some processes in order to simplify and reduce the complexity of the process. However, not all of their recommendations would be applied due to inability to implement these recommendations into the case management system that the Council uses. These recommendations were documented for future reference if the Council decides to implement a new management system than the one they currently use.

Planning the user journey and what is required for the user to accomplish a task was given the majority of the time in this phase. It began by carefully looking at the requirements of each question, as each question required certain information to be filled by the user. After that, the data input methods are evaluated to see which can allow the user to input their data with minimal effort. It was observed in one of design sessions about designing the personal information page, which requires the users to input their personal information such as date of birth and address. The Date of Birth option was very difficult to decide one as some suggested using the date picker, in which the users would pick their date of birth by flipping through dates until they find their Date of Birth. However, it was agreed later on that the optimum way to select the date of birth would by using two drop down lists for the day and month and a textbox for the year. This way different date convention can be avoided as well as providing an easy to understand mechanism to enter date of birth.

Moreover, the majority of the questions asked about conditions were open questions that allowed the users to input the information in a textbox as this was followed in the case management system used in the Council. However, during the following design session were the prototype of the pages were presented. It was noticed how lengthy the transaction will be if the customers had more than one condition, they will not be able to finish it all in one go. Moreover, the transaction will be very difficult for a person who is not familiar with keyboard or has a condition that affects his/her dexterity. To remedy that it was suggested that the question to be converted into a multiple choice question where a person selects the severity of his/her condition by clicking on a radio button. Of course that radio button needed to be large enough so that users are able to click it easily. Figure 18 shows the difference in sizes of the design team had to pick from, the discussion was about how many questions they can fit due to the radio buttons' size so they had to trade off some the length of the questions and the size of the radio buttons.

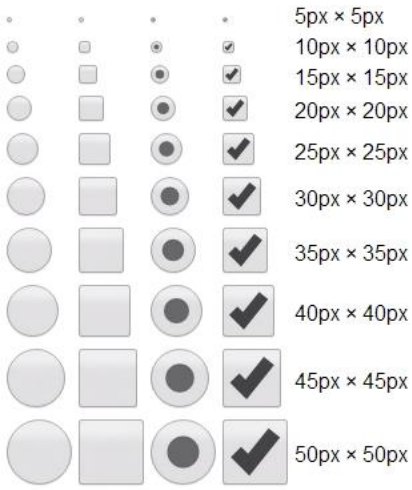



**Figure 18 - Radio buttons' sizes**

**Source: www.gov.uk**

Furthermore, a detailed list of the requirements was created to describe the list of action required for each customer to finish the transaction. This exercise required collaboration between Social

Workers, Care Act Consultants, and Web Developers. The result was very beneficial for the designers as they needed to work on the prototype to be shown in the following design session.

### 6.2.2 Create Phase

In this phase, the design team (particularly the web developers) develop prototypes based on the requirements discussed during the design sessions. The prototypes range from paper demonstrates to functional webpages depending on the ideas discussed in the previous design session. At the beginning paper prototypes where created to demonstrate the layout of the e-service and it will react to customers' input. This paper prototype was used as the blue prints of the e-service to be developed. After that, functional webpages that respond to users' actions but does not do any processing of the data were developed. These webpages were used to demonstrate the e-service interaction with the user. Later, the final linking between the case management system and the e-service was done. This point in particular caused a lot of delay and discussion due the complexity of integrating the e-service with the case management system. It was by far the most challenging part of this phase, as it required a lot of time to bring these ideas into the functional webpages that are compatible with the case management system used in the Council.

This phase usually occurs during the time between design sessions where web developers work without the rest of the team to materialise the plans proposed in the design sessions. The web developers sometime change the tasks to achieve a certain task in order to optimise to the current system or improve it to make it easier for the user. All of the prototypes are then demonstrated in front of the design team to evaluate it appropriateness (As shown in the next section 6.2.3 Evaluate Phase). The obvious problem that occurred

during this phase, was the fixation over what it compatible with the current system. A great deal of ideas were rejected because once the designers started to implement them, they did not work very well in the old system.

The issue of the dependency on the legacy system has been discussed in previous chapter (See Section 5.4.1 Legacy System Alignment) and it manifested itself during this phase. It was observed that the reluctance to improve some of interaction methods were quickly rejected by the web developers due to the old case management system incompatibility. The system required a certain data type for the answers and it was difficult for the web developers to parse some the answers and provide a functional prototype in time of the next design session. Some ideas were immediately rejected without checking whether they can work or not just because they do not work with their system. Evidence suggest that one of the reasons why the case management system had a higher priority than the suggestion to improve the interaction was the time pressures to finish the project in time, as explained by one of the Web Developers:

> "The ideas floating around in the design sessions are great, but we have to do this project on time and the Senior Management are pushing us to the April 1st launch. So it is very difficult to do all the ideas we like to do." (WD1)

These ideas were documented so it can be used in the future upgrades. Moreover, the Web Developers always offered an explanation to why these ideas are not applicable at this moment. However, there was always a sense of disappointment from the Social Workers as well as the Care Act Consultants whenever an idea is turned down or diverted to future updates. When asked about the reason of this disappointment, one of the Social Workers responded:

"We have been here long enough to know that when you are told that this will be a future upgrade, it means it will never happen <Laughs>." (SW3)

This phase was largely done by the web developers who has spent the majority of their time designing working prototypes, the main aim of these prototypes were to test the applicability of the ideas about the transaction, then to see whether the e-service was easy to use or not. It was obvious during the design sessions that the applicability was given higher priority than ease of use. In one occurrence where the e-service layout was discussed and agreed upon by the design team during a design session, it was a shock to some of the design team that their suggestion was discarded and replaced by another one where the layout was closely resembling the old case management system. The Web Developers implied that it was not possible to implement the changes and keep using the system, so in order to do both the new design was implemented as a compromise.

In order to understand how these pages were created, observation sessions of the webpage development were requested by the researcher. This helped the researcher to understand the thought process that led to the creation of these webpages. The initial part of the design process begins by reviewing the parts that was agreed upon during the design session along with the previous prototypes. This step helps to create design objectives for each day as well as help to distribute tasks amongst the Web Developers. After requirements are reviewed and the tasks distributed, the web developers would then create the pages and code them to interface with the case management system. During the coding it was often observed that the web developers would first check the code for the

case management system and then replicate it in the webpages they created so they do not run into errors once they execute it. For example, the once the users input their name and address, the system have to parse them and search for their record in the case management system to check whether they had a previous social care requests before in order to either update their status or create a new request. To do that, the web developers changed the first page of the e-service and made it the personal information come before the part where the user is given the disclaimer. This was not well received by the Social Workers as it violated the process by social care requests are being conducted. As the approval is given at the beginning where the Social Worker would explain to the customer what information they need and where the customer consent to allow them to look for his information in the system. This was later modified in the following design session were the Care Act Consultant explained how this would contradict the requirements of the Care Act. In the case management system used in the Council there was no option to record the consent and usually Social Workers has to verbally confirm this consent with the customers. This incident shows how the Web Developers in the Council would act on their own to create these webpages that are closely aligned with the case management system, therefore ignoring some the requirements asked during the design session just so they can have a functional e-service that can be shown the in following design session.

### 6.2.3 Evaluate Phase

In this phase, the designs and prototypes are evaluated to see whether they were able to satisfy the requirements stated in the Care Act. This evaluation is done in three ways, the first is to evaluate whether the e-service was able to actualise the requirements in the Care Act in terms of the procedure and the accuracy to the information presented in it. The second evaluation, is to check the

functionality of the webpages to see whether they produce errors or if they are able to interface with the case management system effectively. The Third evaluation checks whether the e-service is easy to use.

The first kind of evaluation was conducted during the initial design iteration, where the priority was to capture the requirements of the Care Act in the e-service. The Care Act Consultants and the Social Workers were the main evaluators during these iterations, since they are the ones with the experience in social care issues and the requirements of the legislation. The evaluators in this iteration compared the e-service against a list of requirements they extracted from the Care Act. So the task was relatively easier to conduct as all the requirements were clearly laid out for the evaluators. The only problem was that sometimes these Care Act interpretations were vague and required clearer translation into actionable steps in the e-service.

The functional evaluation however, was conducted by the entire team. Different scenarios were given by the Social Workers which allowed the design team to experiment with the e-service to see how it responds to certain commands and whether the outcome is correct and resemble the outcome that will be given if the customer have contacted the Social Worker over the phone. The task here to see if the e-service is able to capture information from the customer in a way that does not affect their outcome if the customer chooses other means of interaction. These reliability tests have been conducted throughout the design cycle starting from the initial prototype until the final functional prototype.

The third type of evaluation was deemed to be the most difficult, since there were no evaluation criteria to ensure that the e-

service was easy to use by all the potential customers. At the beginning ease of use was always deferred and given less priority than the functionality of the webpages created in the design sessions. As the majority of the evaluation phase was given to the functionality testing of the e-service. Moreover, in order to evaluate the ease of use of the e-service the design team needed to invite people from outside the Council and the design team to conduct the user testing. However, this was always postponed and ultimately cancelled by design team due to the inability to allocate time for user testing as the functionality problems took more time and effort than they originally anticipated. Ultimately, the design team decided to abandon the external user testing and substitute it with another testing round with the members of the design team with the focus on ease of use and usability. However, there were no guidelines for this usability testing to allow the design team have a threshold of usability requirements for the e-service. Therefore, the researcher suggested using the Inclusivity Metric to evaluate the e-service in terms of usability and ease of use. This metric was created to evaluate the ease of use of the e-service based on concepts introduced in the literature review.

Since the e-service could not be used outside the Council for privacy reasons as well as the lack of time, it was suggested to the design team by the research to conduct multiple tests with the Council's e-service and another e-service that offers a high level of usability (See Section 4.4.3 Experiments. This helps to prove the validity of instrument as well as show the areas where the e-service excelled and the areas that needed improvement. The test conducted in the council was done by the researcher and the design team, in order to compare the feedback from point of views as the design team's involvement in the system may cloud their judgement about the performance of the e-service. They are also given a chance to

evaluate another e-service to demonstrate how the Metric works, as well as allowing them to see how other e-services tackle ease of use in their transactions.

However, the testing conducted for external users were conducted in the University's lab with three groups from different age groups to demonstrate in their perception of ease of use. These tests were conducted using the same e-service used by the design team in the Council. This helped in differentiating the between the rating given by the design team and the rating given by the users.

### 6.3.3 Evaluating the E-services

In this section the results of using the Inclusivity Metric are demonstrated. Two e-services were tested for inclusivity by the Inclusivity Metric, namely the Local Council Social Care Registration and Request online forms, and Insurance Company Insurance online forms. Insurance Company's e-service scored 3.85 in the Inclusivity Metric when evaluated by the researcher. Thus, it was chosen to serve as standard of inclusive e-service so it can be compared with the Local Council's e-service because it was a complex e-service but was easy to use and very usable. During the design sessions the researcher showed the Insurance Company e-service to the Design Team and they liked the design said they would like to design something like it. The evaluation sessions were led by the researcher, by first demonstrating how the Inclusivity Metric is used after using the Insurance Company e-service which as stated earlier is the standard to compare other e-services with. However, due to the inability to evaluate the Local Council's e-service to the public it, the users will evaluate the Insurance Company e-service only.

### *6.3.3.1 Insurance Company's Evaluation*

The Insurance Company e-service was used in this research as standard to compare the inclusivity and ease of use with the Local Council's e-service. The Insurance Company's e-service scored highly in the Inclusivity Metric, based on the researcher evaluation. Table 10 illustrates the result of the evaluation. The main strengths and weaknesses is outlined below.

**Table 10 - The researcher's evaluation of the Insurance Company's e-service**

| Construct | Average |
|---|---|
| Readability | 4.475 |
| Affordance | 4.25 |
| Error Tolerance | 3 |
| Organisation | 4.25 |
| Flow | 4.66 |
| Vigilance to Abilities | 2.75 |
| Inclusivity Score | 3.85 |

In this evaluation the researcher added high points for the e-service in terms of affordance, since the e-service provided clear visual clues like arrows to indicate what to do and in which step the user is on in terms of the overall process. Also for complicated terms Insurance Company used an illustration to clarify what they meant, thus ensuring that the users can select the appropriate choice. Figure 19 shows how Insurance Company implemented that in the e-service, when the customer selects the type of insurance cover they would like to use on their property.

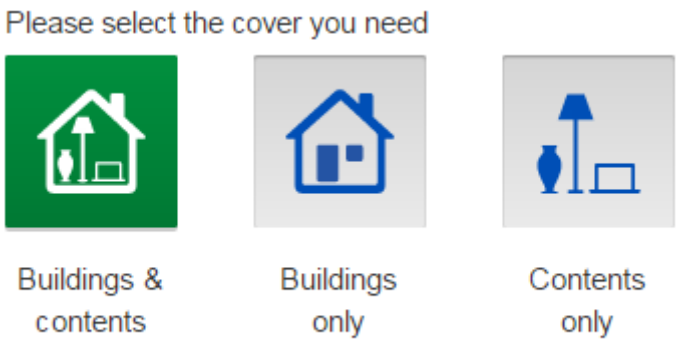



**Figure 19 - The use of illustrate icons to aid understanding (Part 1)**

**Source: www.aviva.com**

The e-service used the illustrative icons throughout the interaction to give a sense of meaning to each question. This helps users understand the purpose of each question. Figure 20 shows how these icons were used in the e-service.

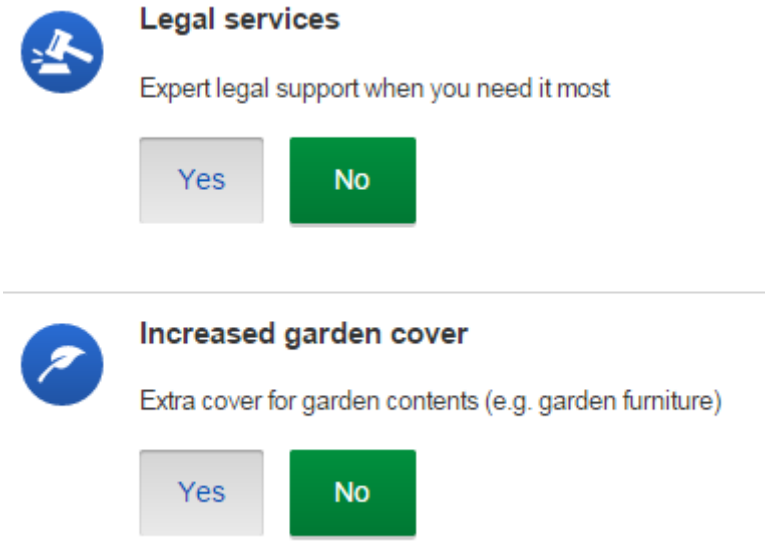



**Figure 20 - The use of illustrate icons to aid understanding (Part 2)**

**Source: www.aviva.com**

In terms of the colour and organisation construct, while the e-service relied heavily on colour, they did not use colour to convey information. It was used mainly to show selection, thus not

compromising the interaction for customers with colour blindness. Also there was clear division of information, as the information displayed in the e-service was logically grouped so the customer can only answer relevant questions within each group or page.

However, the e-service scored low in in terms of the vigilance to users' abilities construct. As the e-service did not offer any option to enlarge text, which can be problematic for customers with vision problems. Nor did it offer a colourless option for those with colour blindness. Even though they did not rely on colour to convey information, it would be very beneficial to the users who suffer from colour blindness to opt for colourless version instead of doing that from the web browser, especially since some users are not familiar with changing the settings in the web browser.

In order to demonstrate how the Inclusivity Metric is used to the design team in the Local Council. The Metric was used by the Local Council design team to evaluate the Insurance Company e-service. In this evaluation session, 9 members from different specialities of the design team were able to evaluate the e-service. Table 11 shows a breakdown of the participants of the evaluation.

**Table 11 - A breakdown of the participants of the usability testing from the Council**

| **Number of participants** | **Participants' Field** | **Age Group** |
|---|---|---|
| 2 | Web Developer | WD1: 25 – 30<br>WD2: 25 - 30 |
| 1 | Project Manager | PM: 35 - 40 |
| 3 | Social Worker | SW1: 30 – 35<br>SW2: 25 - 30<br>SW3: 30 -3 5 |

| | | |
|---|---|---|
| 2 | User Interface Designer | UID1: 30 - 35<br>UID2: 35 - 40 |
| 1 | Digital Team Manager | DTM: 35 – 40 |

While testing the Insurance Company e-service, a scenario was given to the participants demonstrating a case of person who wants to insure his flat. After finishing the transaction, the design team were asked to evaluate the interaction using the Inclusivity Metric (As described in Section 4.4.3 Experiments. The results are shown below in Table 12.

**Table 12 - The design team's evaluation of the Insurance Company's e-service**

| | N | Mean | Highest | Lowest |
|---|---|---|---|---|
| Readability | 9 | 4.11 | 5 | 3 |
| Affordance | 9 | 4 | 5 | 3 |
| Error Tolerance | 9 | 3.75 | 5 | 2 |
| Organisation | 9 | 4 | 5 | 3 |
| Flow | 9 | 4.25 | 5 | 2 |
| Vigilance to Abilities | 9 | 3.6 | 5 | 2 |
| Inclusivity Score | - | 3.95 | - | - |

The results from this evaluation are relatively similar to the results of the evaluation done by the researcher, with three main differences. The first difference was on the Organisation and Colour Construct, the design team rated it with 4 which is 0.25 points less than the researcher evaluation. The second difference was on the affordance Construct, which trailed the researcher's evaluation by 0.25 points. The last difference was with the Natural Flow of the

transaction, which lagged 0.41 points behind the researcher's evaluation.

During the group interview conducted after the evaluation of the Insurance Company e-service, the design team discussed the strengths and weaknesses of the e-service to shed the light on the reasoning behind their rating. When asked about the main features that made the design team score the Insurance Company's e-service highly, the responses varied but they all agreed that the e-service was too colourful, and it was better to just use two subtle colours instead of the 4 colours used in the e-service. The Project Manager stated.

> "Even though the colours were nice, but they were too much… It is not just a matter of taste, it is a matter of not overwhelming the page with flashy colours." (PM)

While the User Interface Designer pointed that they may have done that to reflect on the company's logo colour, but also insisted that they need to reduce the colour in e-service as it can be distracting for users.

> "I understand that they wanted to make it appealing, and use the company's colours. But it was really flashy, I think a person with epilepsy can have an episode from all the blinks in the page." (UID1)

Moreover, when asked about the Affordance construct. One of the Social Workers thought that some of the icons used did not make a lot of sense and were put just for the sake of putting an icon to the question.

"Some of the icons used were just fillers and made absolutely no sense." (SW2)

Though it was not popular decision, one of the Social Workers, claimed that the reason why she scored the e-service low in the Organisation Construct was due to the lengthy and unorganised process of the e-service.

"I think it should have been organised better, as 2 steps were added and were basically fine prints. They could have used one page and compiled all of the fine prints in it." (SW1)

However, the Digital Team Manager claimed that it was necessary to separate them. As these fine prints are concerned with two areas and they cannot be mixed. Thus, in order to have a coherent text they need to be separated, so the information displayed do not become illogical.

"I have to disagree here, the information displayed in these 2 pages are irrelevant to each other. They have to be split in 2 pages, so the page does not become overwhelmed with information." (DTM)

The Project Manager also highlighted the difference between the approaches that the Local Council was following in comparison with the approach followed by the Insurance Company. Claiming that the nature of business for the Insurance Company is different as it is competing with other commercial insurance companies, while the Local Council is a local governing body that does not compete with other entities to attract customers. Regardless of that the Local Council is striving to provide high quality services to its customers.

> "The competitive nature of the insurance market, mandates that they have to attract customers better because if they do not they go out of business. It is a different story for us as we do not compete with anyone. However, this does not give us an excuse to be sloppy, we still have to figure out better ways to engage with our customers online or otherwise." (PM)

In terms of error tolerance, there was a consensus that the e-service was excellent in preventing users from making errors. As all the selections were radio buttons and everything was explained thoroughly. As supplementary information was provided with every question in the form. This also relates to the readability construct as the questions were clearly written and does not allow room for different interpretations. One of the User Interface Designer commented.

> "They did a good job in terms of error handling, whenever the user answers a question a tick is shown to assure the user that he has answered correctly. This is very handy when the user is hesitant during the interaction." (UID2)

The same scenario was given to another group of university students to evaluate the same insurance e-service. This was done demonstrate the difference in the evaluation between the groups from younger users to older users. Thus, confirming the Metric ability to measure the inclusivity of e-services. The evaluation was conducted in a computer lab, and the students were asked to interact with the e-service and then evaluate it using the Metric. Table 13 shows the results of this group's evaluation.

**Table 13 - The younger group's evaluation of the Insurance Company's e-service**

| | N | Mean | Highest | Lowest |
|---|---|---|---|---|
| Readability | 10 | 3.75 | 5 | 2 |
| Affordance | 10 | 4 | 5 | 3 |
| Error Tolerance | 10 | 4 | 5 | 3 |
| Organisation | 10 | 4.25 | 5 | 3 |
| Flow | 10 | 3.95 | 5 | 3 |
| Vigilance to Abilities | 10 | 3.8 | 5 | 2 |
| Inclusivity Score | - | 3.95 | - | - |

From the results it appears that the readability construct scored the lowest of the any other construct. Followed by the vigilance to users' abilities construct. While the Organisation and Colour construct scored the highest. Trailed by the Affordance construct.

The group was then asked to justify their selection in a group interview. They were first asked about the rating in the Readability construct, one of the students claimed that her unfamiliarity with the subject might be the reason why she gave the e-service low ratings for the readability construct.

> "Some of the words seemed confusing, to be fair it is the first time for me ever trying to insure a property." (S1)

While this is understandable, however to for the e-service to be inclusive, it needs to be easy to understand even if the user is not familiar with the context. Thus lowering the barrier to use the e-service. Even though the Flesch-Kincaid readability test gave the e-service a good score, the users gave a contradicting overall results of

the readability construct. This shows how different people's perceptions of what is easy to understand and what is not.

Likewise, the vigilance to users' abilities got the second lowest rating after the readability construct. When asked one of the students pointed that text size was unsuitable as it was very small especially in the fine print area where the users are expected to tick if they agree on the text. One of the students commented on that issue.

> "I thought that the text in the terms and conditions page was really small. You really have to squint to see it" (S3)

While it is unfair to let users agree on a thing they do not understand, it is equally unfair to let the users agree on text they can barely see. This is important because this was reported by a person who is his 20's with no vision problems, so one can imagine how that would affect the quality of interaction if the user was older or suffer from vision problems. When asked whether their grandparents would be able to do the transaction. One student stated.

> "My grandmother is a wiz when it comes to technology. But even with that she will still ask me or one of my siblings to do it for her, just in case they slip something by her and she end up buying unnecessary things" (S2)

Often some company's like airline companies, and hotels try hard to sell extra services while conducting a transaction. While there is nothing wrong with that, the company should make it clear that these services are optional and they do not have to take them to fulfil the transaction, one student also recalls an experience when booking a flight for her parents.

"Choosing the flights for them was one thing. The amount of extras that were offered is another. The main reason why my dad let me buy his tickets is because once he bought a ticket an insurance even though he has his own insurance. So he felt cheated." (S4)

"The way that some websites are created, it seems that that buying the ticket is 2 steps with 4 optional steps added that would just complicate the transaction." (S2)

Regardless of the industry where the company operates on, it customers should be able to know what is required and what is optional so they can make an informative decision. Overcrowding the online transaction with optional services will not only affect the anxiety of some customers that they might be cornered into buying unnecessary services, but also might make them uncomfortable and leave the entire transaction. Which limits their opportunity of getting a fair deal just because they did not use the e-service. A lot of companies nowadays offer significant discounts if customers do the transaction online. It is not fair if the interaction online is very complicated that a person who have limited computer skills might miss out on an opportunity to catch a deal. Especially when they advertise that they offer deals online that are not available in any other platform.

On the other hand, as mentioned the Organisation and Colour construct scored highly by this group. When asked about the reason of this high score, the group was unanimous on their appreciation to the way that information was categorised and their use of colours in the e-service. One student commented.

"I found the website to be delightful, everything was bright and shiny. Everything was labelled correctly." (S5)

Moreover, while asking about the Affordance construct which received the second heighted score in the Metric. The students commended the use of the illustrative icons, claiming they supplemented their understanding of the question.

"The icons that were used were very descriptive. Just by looking at them, you know the nature of the question." (S7)

Also one student commented on the Error Handling construct. Stating that it would be easier for the user to validate their answer as the enter data into the e-service. This could save time for the users and assure them that they are entering the correct type of data for each question.

"It will be much better to check the answers as the user finishes from entering the data. That way you do not have to go back and forth when you make a mistake." (S1)

This instant data validation very helpful especially when the user is hesitant and not sure whether s/he has answered the question correctly. This happens a lot with older users as the computer anxiety is higher than any other age group.

Moving to the final group which is the older adults, the group volunteered to participate in evaluating the insurance e-service, after the last session of their computer training. The users had an idea of how to use computers, emails, and book flights. So they were able to conduct the transaction by themselves. Except for 3 users who asking computer specific questions, like the mouse movement and typing in

the keyboard. Table 14 shows the result of the evaluation done by the older users.

**Table 14 - The older group's evaluation of the Insurance Company's e-service**

| | N | Mean | Highest | Lowest |
|---|---|---|---|---|
| Readability | 9 | 3.75 | 5 | 3 |
| Affordance | 9 | 3.25 | 5 | 3 |
| Error Tolerance | 9 | 2.95 | 5 | 1 |
| Organisation | 9 | 4 | 5 | 3 |
| Flow | 9 | 4.25 | 5 | 3 |
| Vigilance to Abilities | 9 | 3.5 | 5 | 3 |
| Inclusivity Score | - | 3.61 | - | - |

The results of the evaluation were noticeably lower than any other group. The Error Tolerance construct was the lowest amongst the constructs followed by Affordance and Vigilance to Abilities. The highest among the constructs was the Natural Flow construct followed by Organisation and Colour construct.

This user group was given the opportunity to justify their evaluation. First they were asked about the reason why the Error Tolerance construct was scored poorly. Instant validation of the input was the main issue for the majority of the users in this group. As it causes delay to navigate from one page to the next which can be problematic as the process is already lengthy. One user commented on the instant validation issue.

> "Every time I tried to go to the next page it kept telling me that I made a mistake." (O1)

Also the when it comes to notifying the users of the errors they made, some users complained that they did not know where they committed the error. They had spent some time trying to move from one page to the other and some even asked for help from the evaluation facilitators. One of the users commented on this issue.

> "It took me ages to figure out that I made a mistake in my date of birth, as I put the day in the month box. The star was too small to notice." (O2)

Some users voiced concern that making mistakes was one of the main drivers that let them ask their friends and relatives for assistance to conduct any ICT related tasks that deals with money or government transactions. Thus a non-threatening environment in the user interface should be created to allow the users to easily correct mistakes as they happen, reassuring the users that all the transaction as gone smoothly without the need of assistance from anyone. Two of users voiced their concerns about the validity of data and its ramifications on their online experience.

> "They should have not let me send wrong information to the computer. Now I feel a bit worried I by mistake send in the future." (O3)

> "That is my biggest fear –Putting the wrong information- I think it is the reason why I avoid technology all together that is why make my grandson do that sort of things on my behalf." (O5)

On the other hand, when discussing the Affordance construct some user voiced their confusion about the value of icons to facilitate understanding. One user stated that while these icons are sometimes

descriptive of what is the nature of the question, they do not automatically guide the user of what to do to finish this transaction.

> "The icons were useful, but they do not necessarily give me a clue on what to do next." (O2)

Another comment revealed an important issue that often happens to older users, that is whenever they are confronted with a technical difficulty or concussion about the process they directly blame themselves. This comment was agreed upon by the majority of the participants who felt the same way when they are using ICT products or services.

> "I had no clue to be honest, I am clueless <Laughs> I do not think I can do this honestly. I am willing to just look around but when push comes to shove I will chicken out." (O3)

This reveals insight on the group's perception of their self-efficacy. This does not happen to users who are confident with their ICT skills such as the previous two groups. Even though this group has just finished the computer training course, but they still have not got the time to properly practice their ICT skills in real life.

Moving to the Vigilance to Users' Abilities construct, the users justified their low score in this construct by stating that the text used in the pages was small and there were no option to make it bigger, apart from the magnifying option in the web browser. Which is difficult for computer novices. Two users commented on the text size of the e-service.

> "The text was too small I could not see a thing, I could not read it even with my reading glasses." (O5)

"The fine prints were perhaps to fine to even be noticed, if there was not a tick at the end I would even see them." (O2)

On the other hand, this group gave high score for the e-service in the Organisation and Colour construct. They all agreed that the layout and design of the e-service was the main driver for the high score. Two of the users commented on this issue.

"Everything seemed nice and neat, all of the items were clearly marked to the corresponding title." (O8)

"I like how they layout the page, all relevant information are neatly out inside boxes." (O6)

Aesthetics had positive effect on their perception of using the e-service, as they felt that this e-service was trustworthy. This reinforcement effect can play a major role especially when dealing with a commercial product, where companies compete to attract as many customers as possible. One user commented on aesthetics and his decision to pursue in an online transaction.

"It felt legitimate, I would not use anything that would look dodgy. I do not want my bank information to be stolen by some smart guy in God knows where." (O5)

Moreover, the users also highly commended the flow of the interaction with the e-service. Especially since the interaction resembled the process used in real-life. This allows the users to be assured that they are doing the correct step in the process they already familiar that is now automated.

> "If the process was similar to the one that you would normally had if you spoke to an operator, which is reassuring for a person who is hesitant about computers." (O4)

This would be different if the e-service is for unfamiliar process like the one introduced by the Local Council. Regardless, the interaction should be easy to use by all users groups whether they are familiar with the concept or not. Interestingly, one of the older adults preferred the interaction online over talking to a salesperson. This was due to the pressure of avoiding salesperson's suggestion to buy more services.

> "I think it is even better than when dealing with a broker, since you will not feel pressured into buying things that you do not necessarily need." (O7)

While another user still preferred dealing with an actual person, claiming that they would feel more at ease if they can transfer the responsibility to a member of staff to ensuring the validity of the information. This also deals with users' self-efficacy, because if they had more confidence in their ability to achieve a certain task online.

> "I still prefer a human to talk to, at least I can guarantee that he or she got all the information needed and it is now on them." (O3)

While others still acknowledge that they would get better deals and discounts online. But they would still let others do it for them as they worry to make a mistake or overpay for a service they do not need.

"I do not want to be cheated into buying things I do not need." (O6)

"I know that websites like these give tremendous discounts. But I would still let my grandson do it for me. Personally, I think it is bonding experience I have with my grandson" (O4)

Thus making a trustworthy and reliable e-service that enables users to do their transaction at ease is key to enable older users to conduct their transaction online. The Inclusivity Metric can measure these attributes that makes a website friendlier to those who are older or with reduced mobility, thus enable them to have equal opportunities to find information and deals without hassle.

#### *6.3.3.2 Council's E-service Evaluation*

The same was done to the Local Council e-service, with the exception of not evaluating the e-service by users outside the county premises. As stated above this was due to that the e-service was not fully completed and the complexity from the Local Council side to test the e-service with real users. In order to test the e-service only the researcher and the design team were allowed to do so.

First the researcher got a chance to navigate through the system thoroughly, and then evaluate the system using the Inclusivity Metric. Then the design team did the same with complete freedom to go navigate through the system as if they were users of the e-service. Both the researcher and the design team were given a scenario provided by a Social Worker that represent the majority of the cases that contact the Local Council for social care support. After the evaluation is concluded the results of the evaluation are discussed to understand the reasons behind the rating, and to compare the

results of the self-evaluation with the results from the researcher's evaluation.

After, the researcher navigated the e-service, the evaluation using the Metric was done, as the results were as shown in Table 15. The results show significantly poorer inclusivity compared with the evaluation of the Insurance Company e-service. With overall Inclusivity Score of 3.61, and the lowest score for a construct with 3.25 which was for the Affordance construct followed by the Error Tolerance construct and Organisation and Colour Construct. While the Readability construct and the Natural Flow construct were the highest amongst the remaining constructs.

**Table 15 - The researcher's evaluation of the Council's e-service**

| | Average |
|---|---|
| Readability | 3.75 |
| Affordance | 3.25 |
| Error Tolerance | 2.95 |
| Organisation | 4 |
| Flow | 4.25 |
| Vigilance to Abilities | 3.5 |
| Inclusivity Score | 3.61 |

The Affordance construct was low due to the absence of any icons or any sort of visual representation that allows the users to get a slight understanding of what the questions will be about in each page. The screen was bare apart from the questions to be asked. The Organisation and Colour construct was also affected by the lack of any aesthetics features in the e-service. The questions were

organised correctly but the e-service was bland. While the e-service did not rely on colours to convey information, it would have been better if there was some minimalist use to colour in the interface for aesthetics purposes. This helps to engage with the senses of the user and provide a slightly enjoyable experience while using the e-service. This minimal usage of aesthetics improves the overall experience as was discussed in the literature. With the Error Tolerance construct, the e-service did not provide the information of type of data to be used in some textboxes. What was even more damaging was that the e-service allowed alphabetic data in a strictly numeric field. The error was not detected until the form was ready to be submitted during the review section of the e-service. This can be bothersome while dealing with a lengthy service like the Council's e-service.

On the other hand, the Natural Flow construct was the highest amongst the constructs with an average of 3.85. The reason for that, was the decision by the design team to mimic the same flow that a person would experience if s/he requested social care services over the phone or in person. The e-service clearly showed the steps required to fulfil the transaction. This is useful to give the user a sense of direction towards finishing the transaction. Especially since the transaction is very lengthy and users are required to finish it all at one time. Moreover, the e-service informs the user exactly what documents and information needed to accomplish the task before even starting the transaction. This is important to ensure a smooth experience not interrupted by visits to bring documents to input into the e-service. While the Readability construct followed the Natural Flow construct with an average score of 3.75. While the terms used in the e-service were difficult but they were not overly complicated, this is due to the design team mindfulness to describe symptoms in plain English. The terms used were easy to understand evidenced by the Flesch-Kincaid Reading Ease test score of 85 which was rounded

to 4.25. To further facilitate understanding of the terms a help button was included to provide examples and to ensure clear understanding of the questions shown in the e-service.

As a form of internal auditing the design team was invited to evaluate the e-service using the Inclusivity Metric. The same group that tested the Insurance e-service was able to evaluate the two e-services and see the differences in the approach to tackle inclusivity. The results were different from the ones done by the researcher, which is understandable since they have been part of the design process since the beginning. However, this should not discredit their evaluation as they have a great interest in making the e-service become more inclusive as it will return in great benefits for the Council as it will result in a reduced operation costs for an already costly project.

Looking at the results, the Natural Flow construct scored much higher compared with the results on the researcher. Also the Error Tolerance construct was the highest among over constructs, scoring an average of 4.15. The Vigilance to Users' Abilities construct was the second highest with an average of 4. While the lowest was the Organisation and Colour with a score of 3.2. Table 16 demonstrates a breakdown of the results.

**Table 16 - The Design's evaluation of the Council's e-service**

| | **N** | **Mean** | **Highest** | **Lowest** |
|---|---|---|---|---|
| **Readability** | 9 | 3.8 | 5 | 3 |
| **Affordance** | 9 | 3.7 | 5 | 2 |
| **Error Tolerance** | 9 | 4.25 | 5 | 3 |
| **Organisation** | 9 | 3.2 | 5 | 2 |
| **Flow** | 9 | 4 | 5 | 3 |

| | | | | |
|---|---|---|---|---|
| **Vigilance to Abilities** | 9 | 4.15 | 5 | 3 |
| **Inclusivity Score** | - | 3.85 | - | - |

Following the evaluation a discussion was carried out to discuss the results. Looking at the reasons for the score that has been given to e-service, and allowing them to reflect on the evaluation done with the Insurance e-service compared with their evaluation of the Council's e-service. Starting with the Error Tolerance construct, the technique used in the e-service was not effective nor efficient to detect and correct errors. Especially since the users will wait until the end to know whether they have committed any errors. This plays a major role in the user's experience as they already long forms will be even longer when they have to revisit these pages to correct the errors. The Web Developer defended their decision to follow this strategy for error handling.

> "We decided that we want to add the review section so users have a chance to look at the form and correct any error they may have done and to confirm it before everything become finalised" (WD1)

However, the decision of the error handling techniques used in the Council's e-service was taken so they would not have difficulty integrating the old system with the new interface for the e-service. This shows how dependant the project is to the legacy system used for managing social care. In this instance the needs of the system have been put on top of the needs of the users for the sake of avoiding difficulties. The Project Manager and the Web Developer has revealed this during the group interview.

> "I see the advantage of instant validation. However, with our system that we are using adding this technicality was nightmare" (WD2)

> "With current system that we have it is very difficult to implement such feature –Instant validation- but it is something that we need to look at in the future" (PM)

This shows the priorities of the design team to whether to improve the inclusivity levels of the e-service or have a running service that is produced on time for the Care Act implementation. Time pressure was one of the main reasons to blame for the rush to produce this e-service. Given the complexities the team has endured to first optimise the process and then implement it online, there was not enough time to properly test the e-service with actual users. The efforts to establish a full user testing was throttled to fine tune the e-service to the old system and provide a functional service to their customers. One of the Social Workers seemed surprised that the state of inclusivity the e-service was in while conducting the evaluation.

> "I think we still have a long way to go to call this e-service as an 'inclusive'. But honestly I was surprised that we have not implemented strong data validation techniques in this day and age" (SW2)

On the other hand, the Web Developer showed interest in incorporating the recommendation of the Inclusivity Metric to future updates to this and other e-services. This demonstrates the team openness to change and respond to customers' needs when they emerge.

"One of the things I found interesting is showing them an example data should be in the fields I think that would reduce a lot of the errors we will get once we go live." (WD1)

Moving to the Logical Flow of Information Construct, the team was happy with their efforts to make the process logical. This was reflected in their evaluation as well as in the interviews. There was a consensus among the design team about the level of flow that the e-service provided. The team has used the majority of the design time to redesign and optimise the process so it becomes easy and does not have any conflicts with the procedures in the social care system and the new legislation.

"We tried to make as logical as possible. We used the same scenario that person might have when dealing with a person" (UID1)

"We actually optimised both process –online or over the phone- to provide an easy and fast interaction that allows the customers to finish the transaction at ease" (DTM)

This task is very difficult due the difference in experience between customers and social workers. As with the new e-service customers will have to everything by themselves like providing their details and the nature of their condition. Where before a social worker would do that for them after inspecting the person's condition. The speed of which this will be done is different as social workers have years of experience that allows them to identify the condition and quickly file it in the system. The Project Manager talked about the time it the design team to streamline the process so customers become in equal footing with the experienced social workers.

> "It took us ages to make the process as easy as possible. Given that the process was done previously by social care professionals, moving it to the hands of customers was very difficult task to achieve." (PM)

Given the length of the e-service, the steps with indicated in the top of the page so customers can know what steps are coming to finish the transaction. Because when customers are dealing with a social worker directly they can ask question to about the time needed to finish the transaction or what is coming next. To implement that electronically a breadcrumb trail was used to visualise the steps. This technique reduces the embarrassment caused by asking the social worker how long it needs to finish the transaction. The Web Developer highlighted this issue.

> "We wanted the customer to visualise the steps required to finish the task so he does not feel that it is too long or too complicated for me" (WD1)

On the Vigilance to Users' Abilities Construct, the team was satisfied with the way the e-service has turned out. The team's User Interface Designer assured the rest that all the accessibility guidelines were met.

> "We followed all the guidelines for accessibility in our forms. As all government entities mandated to." (UID1)

However, these guidelines provide the minimum criteria for government's website. Thus just abiding to the minimum requirement does not ensure inclusivity. A true user involvement in the design process is key to achieve higher inclusivity levels, as these users will give insight on the way they interact with the service. Thus

freeing the designers from making educated guesses on what would work for a certain user group. This will enable the designers to be more sympathetic to users' needs as they can see it with their own eyes. Moreover, it will reduce the amount of rework that will be done after the e-service goes live and users raise usability complaints, assuming they were given the opportunity to do so to begin with. However, user testing was not used in this project due to time pressures and financial constraints. The Project Manager explained how they managed to overcome this issue.

> "When we were designing I always kept saying, would my mom be able to use this forms. I used it as reality check every now and then during the design phase." (PM)

While this exercise of self-reflection was useful for the team to anticipate the needs of the users, it is far from being able to capture the actual needs of the users. Even though user testing is time consuming, the design team can find cheaper alternatives for user testing like simulators (See Section 3.4.3 Simulation Tools). The Inclusivity Metric can be used to influence designers to some usability issues but it does not replace the benefit of user testing.

On the other hand, the Organisation and Colour construct was poorly scored due to the design team focus on the basic functionality of the e-service and not the aesthetics features. While the team acknowledges the lack of aesthetics feature, they are postponing this until after everything goes live. Giving them more time to address the more serious issues with the functionality and the interface with the old system. The Web Developers in the team have discussed these issues in the interviews.

> "We were mainly concerned with the functionality at this point we did not pay enough attention to the layout and the graphics needed for the e-service." (WD1)

> "Our forms look boring, but this is just the start we will continue to improve them as we go along" (WD2)

Minimal design was the chosen approach to designing the e-service. It was chosen to reduce the load on the e-service so it does not look crowded with graphics, which is departure from the way the Council's website's design. The e-service was considered as the new template of the way e-services and webpages are going to be in terms of functionality as well as layout. The User Interface Designer agreed that minimal design will be followed throughout the website in the near future after this project.

> "Well it is minimal at the moment, I do not know if we will continue to keep it this way or change it. But I agree that we need minimalist design so we do not overwhelm the page." (UID2)

Compatibly and operability across multiple platforms was coined as the one of the reasons to implement a minimalist design for the e-service. The Project Manager argued that minimalist design is important to ensure that the e-service does take a long time to load when used in a mobile device due to graphics. Also both interfaces used in these platforms need provide the same level on interactivity so users do not have a different experience moving from one platform to the other.

"More importantly, we need to optimise the forms to be accessed from mobile devices. So the more graphics the less compatibility with these devices." (PM)

While it is believed that incorporating user testing in the project development lifecycle would provide a great deal of insight on how users will use the website. It is difficult for some projects to incorporate them due to financial and time constraints. So the Metric can be thought of as a cost effective measure to investigate whether the website is friendly to older adults and users with disabilities. The Project Manager attests to the difficulty of including user testing phase for some projects due to constraints.

"Surely bringing actual users and involve then in user testing is great to build something around the user… But we either have shortage in time or money to do a full blown user testing… specifically with this project we're limited wit time as the legislation comes to law in few months and we have to have something that satisfices the criteria that the new law requires." (PM)

Moreover, choosing the right words and format is very difficult when designing a complex online service that often rely on the users' field knowledge and expertise. However, that might turn off users from using the online service and send them to the customer service desk which defeats the purpose of having the online service to begin with. The addition on a readability test on the Metric was praised by one of the user interface designers in the project.

"I think the inclusion of a readability test in the metric is handy, as we had long discussions about the wording of each question in the form, because we did not want to use words that are too

> ‘social care-y’ that the average user might not understand. It is been tough trying to figure out which words convey the meaning that we wanted without being too technical and distance our customers who might not get them.” (UID2)

The readability test in here was used to demonstrate the grade level required to understand certain terms. It was not surprising the online forms scored poorly Flesch–Kincaid readability tests as the terms used were complex and context dependant. Thus the interface could use some dilution in terms of the choice of words, as the users might not be too familiar with social care related terms.

Meanwhile, careful thought and consideration need to be put in place to ensure that online forms are logically and cognitively sound. As a great deal of automation projects consider the needs of the system first and the then the needs of its perspective users. The online service should be thought of as another mean to interact with and serve the organisation customers, not just interface to the systems that the employees use. The online service should enable users to understand what is required of them and what do they need to do in order to achieve the task at hands. This was mirrored in the social worker’s remarks on the difficulty of automating the complex processes related to social care.

> “It is very complicated to automate the stuff that we do during the assessment. There are a lot of steps that we do in order to assess a condition and assign it to the right team. So we need to be extra careful not to misrepresent any information that we will put on the online form and try our best to mimic the stuff that we do regularly.” (SW1)

The Web Developer also shared the same notion about the difficulty to mimic the logic of social workers as they have the experience and knowledge to know what to do in each case, thus it was really vital to understand the process properly so the interface becomes easier to use and understand.

> "For this project in particular we spent a lot of time trying to untangle a very complex procedure that the social workers and the customer service representatives tackle on a daily basis. The forms should act in the same fashion that our people would work. So the form should have some sort of built in logic which take some time to understand but once understood can be easily automated." (WD2)

However, one of the Web Developers pointed out that even though they tried to develop logical online forms, they still had to struggle with the systems that they use in social care in the county. Indicating that a lot of designers and web developers feel like they are between a rock and a hard place trying to balance the requirements on the users as well as the requirements of the systems the online forms have to interface with.

> "We are obligated by law, to provide online service to anyone regardless of their condition. I mean there's a lot stuff that we do in order to do that. But sometimes we need to adhere to system requirements in terms of the data types and other required information. In this case in particular we are using the online forms to interface with our social care system, and sometimes we're limited of what we can achieve with it." (WD1)

It is very important to be mindful of the designers' feeling while evaluating the website as it could be thought of as criticism of their

work, especially if it is done by an 'outsider' like the case of this research. The main user interface designer felt like he was being cornered and he felt that he had to defend his work from the results of the Metric. Even though he was told repeatedly that this is an investigation of the benefit of using a Metric to ensure that online services were as inclusive as possible.

> "I usually go with what makes sense to me and my colleagues, because there's ton of guidelines out there we try our best to keep up with them but you're only human! There only so much that we can do especially with time pressure with all the projects that we handle. I see the benefit really… But I'm not sure that we can do all the trouble of doing the Inclusivity survey… I have a lot of experience designing websites and online forms, I think that would be helpful for a new designer who might be more eager to design fancy stuff rather than taking the users' needs into consideration." (UID1)

While the other user interface designer did not share the same resistance to the idea, he was aware that there is potential for improving the online forms, embracing the idea to put these designs that he felt so protective of under evaluation to see whether they tick the boxes in terms of inclusivity.

> "I was surprised to see our online form averaging a 3.85 in the Metric… But then again we have to take a step back and see this rating as an opportunity for feedback and improvement… I tend to treat the projects I work in as my babies but I know that we can definitely improve." (UID2)

Nonetheless, a social worker pointed out that the Inclusivity Metric can be used as marketing tool to demonstrate how inclusive

the website is, by using the score achieved to show the organisation's commitment to show that they have taken serious steps to ensure that services provided can be used by a wide range of users irrespective of their abilities and computer knowledge. The organisation can use this advertising opportunity to convey itself as an organisation that cares about who uses their online service and it is pledged to make the interaction with its services as convenient as possible to its customers.

> "I can see how we can use the results of the Inclusivity Metric to our advantage if we made put the rating in our website to show how committed we are in ensuring that we care about our customers… If this thing gets a public attention and other websites follow through, I can see great potential in incorporating this inclusivity rating in our Local Council website." (SW3)

As echoed by the Project Manager in the team, the Inclusivity Metric needs true commitment from the project team as the evaluation process takes a significant amount of time. As the evaluator needs to first interpret the criteria allocated for each construct, and then navigate through the interface thoroughly to assign the appropriate score for each criterion. Of course not all the constructs can be automated; there are constructs like the logical flow of the interface that can be measured by the evaluator's expertise. Nonetheless, automating some constructs in the Inclusivity Metric can be deemed useful to reduce evaluation time and effort.

> "While I definitely see the advantage of it, I think it will be better if it was automated so we do not have change the readability test to 5-scale. It would be a turn off for designers

if they have to do it on a paper and then compile the results" (PM).

Also the Inclusivity Metric can be used by actual users as part of the user testing phase of any project. Unfortunately, this research did not introduce the Inclusivity Metric to users with different capabilities, due to time constraints in the Local Council and the need for the form to go live as quickly as possible. The Inclusivity Metric can be used during user testing to allow users to evaluate the interface. It is important to note that some constructs need to be slightly changed so users can easily understand what and how they need to evaluate the interface.

"If we can dilute the survey a little bit we can actually use it for user testing, it will be brilliant to see how designers rate their design and how they users actually rate them" (PM).

As mentioned above by the Project Manager, the Inclusivity Metric can be beneficial during user testing that creates an opportunity for designers to see how different their views of their design to the views of the real users, opening up the users' perspective to the interactivity and ease of use of the design.

#### *6.3.3.3 Comparison*

In this section a comparison between the groups who used the inclusivity Metric will be discussed to show the differences between these groups in terms of their perceptions of inclusive design. The comparison will only include the results of the Insurance e-service evaluation, as this e-service was evaluated by all the groups. Unlike the Council's e-service which was evaluated only by the design team and the researcher. Using the Insurance e-service will provide a clearer picture of the usability requirements for each group, by

highlighting the constructs that were scored highly and the ones that got scored poorly in each group.

Table 17 shows a breakdown of the participants of the evaluation. 9 members of the design team were invited to conduct the evaluation of the e-service, the majority of them were females with an average age of 35. Where 10 participants conducted the evaluation for the younger group with a majority of males and average age of 21. Finally, 9 older users evaluated the e-service with a majority of females and an average age of 72. The participants were asked a question to determine their perceived computer skills. The design team and the younger users ranked their computer skills as high, where the older users ranked their computer skills as low even though they just completed a basic computer training.

**Table 17 - A breakdown of the participants of the usability testing**

| | **Design Team** | **Younger Users** | **Older Users** |
|---|---|---|---|
| **Number** | 9 | 10 | 9 |
| **Gender** | 4 males, 5 females | 6 males, 4 females | 3 males, 6 females |
| **Average age** | 35 | 21 | 72 |
| **Computer skills** | High | High | Low |

The groups selected provide a wide variety of users' experience in terms of education level, age, disabilities, and computer skills. Thus, represent a small percentage of users in the real world. Even though the number of the research participants is not suitable to make sweeping claims about inclusivity. It provides views of the research participants of what constitutes an inclusive e-service, thus linking the ideas from the literature with the real world.

A comparison of the results shows insights on the differences and the similarities among these groups. Table 18 shows breakdown of each research participant and their corresponding score for each construct and the overall inclusivity score for the Insurance e-service.

**Table 18 - A comparison between the results of the usability tests of the Insurance Company's e-service between all groups**

| | **Researcher** | **Design Team** | **Younger Users** | **Older Users** |
|---|---|---|---|---|
| **Readability** | 4.475 | 4.11 | 3.75 | 3.75 |
| **Affordance** | 4.25 | 4 | 4 | 3.25 |
| **Error Tolerance** | 3 | 3.75 | 4 | 2.95 |
| **Organisation** | 4.25 | 4 | 4.25 | 4 |
| **Flow** | 4.66 | 4.25 | 3.95 | 4.25 |
| **Vigilance to Abilities** | 2.75 | 3.6 | 3.8 | 3.5 |
| **Inclusivity Score** | 3.85 | 3.95 | 3.95 | 3.61 |

In this comparison it can be noticed the older adults group rated the Insurance Company's usability less than any other group in the Inclusivity Score. Error Tolerance was one of the main constructs that reduced the Inclusivity Score, while the Flow constructs was the highest among the evaluation results. It can be noticed that all the usability testing results indicated that the Insurance Company e-service is categorised high according to the inclusivity levels introduced earlier. Which means that the majority of users can use the e-service with little effort. This means that the company can feel comfortable that their e-service would be usable by larger user groups; ultimately, this will allow the company to attract as many users to their online service.

More importantly, this shows the ability of the Inclusivity Metric to capture the perceptions of inclusivity from the research participants in a consistent manner. Since all of the research participants rated the e-service that they used in relatively the same way. Obviously, the older research participants rated the e-service the least among other participants. This is understandable since they finished the computer course and their computer skills are not as high as the other research participants.

**Table 19 - A comparison between the results of the usability tests of the Council's e-service between the researcher and the design team**

| | **Researcher** | **Design Team** |
|---|---|---|
| **Readability** | 3.75 | 3.8 |
| **Affordance** | 3.25 | 3.7 |
| **Error Tolerance** | 2.95 | 4.25 |
| **Organisation** | 4 | 3.2 |
| **Flow** | 4.25 | 4 |
| **Vigilance to Abilities** | 3.5 | 4.15 |
| **Inclusivity Score** | 3.61 | 3.85 |

Likewise, Table 19 shows the difference between the researcher's evaluation and the design team's evaluation to demonstrate how the constructs were rated. The results also showed that both the design team and the researcher rated the Council's e-service in a similar way. Categorising the e-service as high in terms of inclusivity.

It is important to note that the findings demonstrated here does not suggest that the results of the Inclusivity Metric is genrelisable due to the small size of the sample used for testing. The main purpose of the Inclusivity Metric in this research is to show the Design Team how their e-service was doing in comparison with the inclusivity constructs set in the research and to see what other e-services are doing to improve their e-services.

## 6.4 The Designers' Perspective

In this section the implications of utilising the Inclusivity Metric are discussed to show the design team perception of how using the Metric can change the design practices in the Local Council. First, the impact of the metric on the design process will be discussed. Showing how the Inclusive Design practices changes the design process and direct the team's emphasis on user needs and how well the proposed system can fulfil these needs. This emergent theme focus on the effectiveness of embedding user testing in the design process and utilise the Inclusivity Metric to ensure that user's needs are met in the design. Then, the communication emergent theme is discussed to show the impact of utilising the Inclusivity Metric to communicate the strengths and weaknesses of the design. Given the nature of the project and the diverse disciplines of the design team, communication issues have arisen whilst trying to evaluate the effectiveness of the e-service. Finally, the Business Process Redesign emergent theme is discussed to show how making the user as main focal point of the design effort and try to match the users' requirements with the requirements of the legalisation. Thus, ensure that the e-service does not require more effort of the users to understand and that tasks are easier to understand, while ensuring that the steps required follow the rules and regulations of the new legislation.

### 6.4.1 Design Process

One of the major impacts of the Inclusivity Metric was on the team's perception on the design process. After using the Inclusivity Metric, it was apparent to the team they have always changed their design process just to cater to the demands of the senior management and little to the needs of the customers. Evidenced in the lack of user testing session conducted for many of their ICT projects. Even though there is a team dedicated to improving user's experience in the Council. However, the during budget cuts and pressures to finish on time the user testing becomes a lower priority and is automatically replaced with educated guesses on what should work for the user, which reduces the e-service's ability to cater to the needs to diverse user groups and only uses designers' knowledge regardless of how accurate it is. The Web Developer pointed at the variation between the plan and the execution.

> "In every project we start with an ambitious outlook towards how it will look and how it will help the users whether staff or customers. But we end up with scope creep and we start cutting off the things that we think are unnecessary. The first things that we cut of is the user testing." (WD1)

> "I think it demonstrated how important the role of the user in the design process is. We saw how neglecting to conduct proper user testing has affected our score in the Metric" (WD2)

While the Metric proposed by this research is not a substitute to user testing, the Metric should be considered as a complement to user testing. As the impact of utilising such technique can improve the e-service's performance with older users, users with disabilities,

as well as able-bodied users. The Metric can be used during user testing to provide a mechanism for users to evaluate the e-service.

> "With can use the Metric as part of our user testing. To demonstrate how well the design is responding to the needs of our users." (PM)

The Metric shifted the design team's attention from catering to legacy system's needs to focusing on producing an e-service that makes the process easier for users. The design team needed to look at the big picture by first looking at the process by which users will have to follow in order to finish the transaction, then design the e-service in a way that does not complicate the transaction for the users as the system's requirement can be reconfigured to match the user's needs. Thus allowing the organisation to cover as many user groups without compromising on features or aesthetics. The User Interface Designer pointed out the change of focus in the design team with respect to users' needs.

> "It puts the user back in the map. By looking at what matters to them and not what matters ourselves." (UID2)

Mistakes done during the design will only complicate the issues to other stakeholders. Thus proper evaluation of the design will help to find these potential bottlenecks and actively eliminate or reduce their effect. Moreover, the Inclusive Metric helped the designer in this project to be more empathic to users with reduced abilities, as the designer was fixated on aesthetics features of the interface and the Inclusivity Metric helped the designer to strip down some of the aesthetic features that might make it difficult for an older adult or person with disability to navigate and use the interface easily. While aesthetics is important for user interface design they need to be used

with extra care so the user interface does not get overwhelmed with graphics and animation, moderation is key to ensure that the user interface is visually appealing and considerate of users' abilities. The Project Manager expressed his frustration with current designers' mind set when it comes to designing interfaces.

> "The problem nowadays is that the designers are so obsessed with creating a cool looking website, that they might forget that they are doing it for other than themselves. So I think this survey is useful to let them step back a little and look at the big picture to really understand what the users especially those who are older or have some kind of disability. It is not just about providing a screen reader on the website. It is more about being aware of users' needs to provide something that they can really use." (PM)

However, the problem remains with the Council's ability to become agile and proactive. The senior management in the Council continued to push for e-services to publish as soon as possible regardless of the quality of these e-services. Also the teams are incentivised by the completion of the project within budget and time, with little emphasis on the quality of the produced e-service. This permits the designers to design half-baked e-service that does the basic functionality and worry about the quality issues later. In most cases the e-service will remain as it is until something is pointed out either by staff or by customers. Two of the Web Developers pointed out this issue with the lack of proactivity in the Council.

> "Our problem here is the 'if it is not broken why fix it' mentality. It seems sometimes that our priority is just to finish the project and worry about the usability issues later if someone notices them" (WD2)

> "The problem again remains with the unrealistic expectation of the management. Demanding a quality online service requires more time and effort than what we have got in this project" (WD1)

The issue revolves around the Council's short term mind frame, in which priority is placed immediate budget saving opposed to sustainable business processes that save costs in the long run. The automation of this process can significantly reduce the need for social workers to do data entry transactions that could be done by the user. However, to do so the e-service should be suitable for the majority of the users. Thus reducing the load on social workers, and reducing the costs for both users and the Council. If thorough user testing is implemented using any of the usability techniques (See Section 3.4 Design Evaluation Tools) in conjunction with the designers' knowledge, the resulting system would be highly suitable for the diverse users' needs that cannot be anticipated by designers' expertise. The Project Manager and the Web Developer shared the same thought when it comes to the Council's strategy for cost saving.

> "It is all about cutting costs at the moment, but what you miss out is that the high initial costs will result in reduced operations cost. It is just a matter of when these costs will incur" (PM)

> "The results show the ramification of short term planning opposed to long term planning. It will take more social workers to respond to queries over the phone rather than allowing the customers to do it themselves" (WD2)

### 6.4.2 Knowledge Transfer

Another emergent theme that highlighted the impact of the metric was on the communication among the design team as well as the public. Firstly, it helped to facilitate and organise discussion about the issues important to the user interface. Especially since IT professionals tend to use IT jargon and field related terms that are not well understood across the project team evidenced by the Social Worker who struggled to understand the jargon used by some of the IT professionals. The Inclusivity Metric helped to guide these conversations showing designers and other stakeholders the areas where they need to place more emphasis on to make it easier for users regardless of their abilities to interact with the interface.

> "To be perfectly honest, I did not know what the IT folks were saying about user journey and navigation. I'm keen in understanding what the issues in the online forms are, because I'll get a lot of phone calls from customers who do not know what they need to do next! So being able to pinpoint issues in the forms now and know what they are called is handy… I can just point at it in the survey and tell the folks here what needs to be done" (SW2).

This is important to help reduce the tensions between project members as communication between members is significant for project success. It also helps to build ownership of the project among the team especially during structuring the logic of the interface and the wording for text in the interface. Collaboration and discussion among project members is helps to channel each member's expertise on some issues like the terms used in the interface rather than leaving the task to a single team member and then having to redo the interface if things are not satisfactory. While these discussions can be time consuming but reaching consensus while designing is

easier than finding errors at later stages. These concerns were also voiced by another Social Worker, as she used the word 'we' to describe the predicament of having online forms that are difficult to use.

> "We need to get it right, because having lousy online forms will just result in us having to do the application for our customers. This is really counter intuitive! I've seen this in previous projects where we were told that going online would be good for us and our customers, but obviously we got as many calls –or sometimes more- to help customers finish the application and we end up doing it for them! Well this project is no different as we expect the beneficiaries to primarily older folks and people with disabilities so we have to be mindful in our online application" (SW2).

One of the main advantages of the Inclusivity Metric is the ability to assess the design performance objectively by looking at the design's ability to respond to the users' needs within the defined constructs. With the Inclusivity Metric the design team can discuss the strengths and weaknesses of the design to ensure that the e-service is able to cater to the needs of the diverse user groups. More importantly be able to quantify the level of inclusivity of an e-service, to help the designers to visualise their effort. The Social Worker stated the importance of being able to evaluate their process during and after the design sessions.

> "Being able to evaluate our forms and then have a conversation about what are we doing well and what not is very helpful to improve ourselves" (SW2)

The Metric was able to facilitate learning and discussion in some aspects. This was found in the case of one of the Social Workers who was facing difficulties expressing herself during the design session. She was frustrated with the look of the e-service, and trough out the design sessions she was certain that there was something that is not going well in the design e-service. Below is her response to using the Metric to resolve her issue with the e-service.

> "The forms were a bit odd on some aspects. I did not know how to articulate these issues. For me it was the lack of aesthetics in the forms, I think the Metric was handy to help me point them out." (UID2)

While it was obvious that the Metric is tool to collect feedback about the e-service's design. It is important to make sure that the design team is willing to take criticism and not become defensive about their design decisions. This was the main issue noticed during the evaluation, the design team was very critical during the evaluation of the insurance company e-service but was very defensive and sympathetic towards their e-service. This shows the importance of having an impartial eye to provide another perspective, so the e-service can truly benefit from the evaluation and not just conform to the beliefs of the design team or just give the senior management what they want to hear. When asked about their defensive behaviour during the evaluation, both the Project Manager and the Digital Team Manager expressed his openness to feedback and if the Metric is the tool that is going to facilitate that then they have no problem embedding the Metric in their design lifecycle.

> "We are open to any feedback whether from customers or staff, and if the Metric is a way to gather this feedback then we are all for it." (PM)

"I do not see why not, if it is a mechanism to gather feedback on our performance then we are all for it." (DTM)

While the Web Developers expressed their need for a new perspective with a fresh outlook to the problem that might help the team to look at the problem objectively. This helps to identify flaws in the design and areas for improvement before releasing the e-service to the public.

"Sometimes you need another perspective to improve your services. When you work for so long in a particular project sometimes you get tunnel vision." (WD1)

"It is not just about feedback, we need to proactive in addressing the shortcomings of e-services, and the way we do things" (WD2)

Furthermore, the Metric results can be used as a communication tool between the design team and the senior management. The Metric can be used a success rubric to show how the e-service responds to the needs of customers. This can help justifying the development costs of the e-service when used in comparison with the operational costs of conducting the transaction without the e-service. The Project Manager showed his enthusiasm to use the results of the metric to show the project's progress. While this is useful it may result in the design team giving good inclusivity score to the e-service just to appease to senior management, which again places the importance of third party evaluation whether by user testing or internal testing by another team to provide unbiased results.

> "With this kind of evaluation we can visualise our progress to senior management to ensure that we are all in the same page in terms of service quality." (PM)

Another evidence from the Web Developer that showed the senior management's fixation on time and financial milestones instead of the quality of the services provided. While it is important to finish the project in time and budget, quality is another pillar to the project success. The Metric was seen as a measure to justify the team's delay in delivering the final system, by using the Metric to demonstrate the quality of the e-service. Again this should be done in objective way so the results do not become skewed to satisfy senior management and not reflect the truth.

> "We should also give the results to the senior management to show how much our online forms achieve these standards and tick the boxes of quality instead of being focused on finishing the project in time" (PM)

On the other hand, the team also wanted to publicise the results to the general public to reinforce the Council's effort to be more sympathetic and open to older customers and customers with disabilities. Showing the Council's commitment to social responsibility to provide customers with equal opportunities to access information and engage with the Council. Thus eliminating any form of discrimination towards older customers or customers with disabilities. Two quotes from research participants demonstrated the Council's willingness to communicate the results to the public to gain public appreciation of the Council's effort.

"We can communicate these results to the public to show our commitment to provide web services that cater to all people regardless of their age or physical abilities" (WD2)

"This would truly help to give the Council a better image in terms of social responsibility and attentive to users' needs" (DTM)

### 6.4.3 Business Process Redesign

An important emergent theme that was mentioned in the interviews with the design team was the Business Process Redesign theme. Within this theme, discussion about redesigning the business processes of some of the services offered by the Council to make them more suitable for users instead of being compatible with the system's requirements. Evidence that showed the Council's fixation on satisfying the legacy system were clearly communicated during the discussion about the challenges that hinder Inclusive Design practices in the Council (See Section 5.4.1). The design team were able to reflect on the implication of using the Inclusivity Metric to help guide the conversation about where requirements come from. Allowing the team to look in depth and question the need of some transaction. Especially since some tasks are treated as mandatory steps while in fact they are not very important. Thus the design team need to actively challenge the status quo, and collectively with the customers agree on what steps need to be in the e-service to ensure that the process is logical and does not violate any legalisations. Two of the design team shared insights on the need to rigorously evaluate the steps needed in the e-service to be able to satisfy the needs of both the system and the user.

> "It really allowed us to take a step back and really look at our processes. Because once you see the bigger picture you notice how unorganised some steps were." (PM)

> "I think we were so immersed in the old system that we forgot that we can change things now and make the process fit the user instead of the other way around." (WD2)

As evidenced in some of the quotes using the Metric can help the design team to refocus their attention on usability. Especially since the tasks in the e-service are going to be used by the users, thus they need to be easier to understand and not require a lot of effort from the users. Embedding user testing and incorporating the Inclusivity Metric with it can provide another perspective on the e-service's appropriateness to older people and to people with disabilities. The Digital Team Manager expressed the importance of understanding user base's capability before releasing the e-service since the users now will do the tasks that were done by social care professionals.

> "It was a true eye opener, we needed to step out of the ways were did things in the past as we will let the customers do the heavy lifting. We used to rely on our staff's knowledge to finish transactions it really different now." (DTM)

Placing the costumer in the centre of the design of the e-service gives it an advantage as customers nowadays can choose between different alternatives and they are not bound to organisation in anyway. So the organisation that gives the customers an easy access to information and services tend be more attractive to the customers this was evidenced during the discussion with the users while talking

about the quality of the service (See section 7.43) and also acknowledged by the User Interface Designer in the design team.

> "In a way we are empowering the customer to make his/her on choices. So we have to make the process suitable to them and not our system. Customers now have options, if they find that this website is too complicated or does not fit their needs they can easily switch to another one." (UID2)

Balancing the requirements between the users and the system need to be carried out diligently, to ensure that there is no compromise to the in the system's performance as well as the system's ease of use. This active negotiation needs to take place to with presence of the users as well as the field professionals, to help reduce the gap of expectations between both parties. Finding this balance can be challenging when the designers have strong belief that they know what the user will like and can anticipate the needs of the users without the need for user testing. Evidence of that were revealed during the discussion with Project Manager and the Web Developer about the necessity of user testing, and whether the designer should have the final say in what the end system will look like.

> "I think there should be a middle ground between looking at the customers' requirements, system's requirements, and the new legislations' requirement. It is all about finding that sweet spot where everything falls into place perfectly." (PM)

> "It is a debate in the IT world, to where should we take system's requirement from. In a way we can say that we are the experts in the field and we know what works and what not. On the other hand, we can also argue that the customers are the ones who

should be able to have a say on the staff that they will use." (WD2)

At the end, the issue revolves in the Council's ability to get feedback from the users and implement it in the services that they provide. Part of the reluctance to conduct user testing is not just the logistical issues of finding users and facilities to conduct the testing in, it is more about the Council's desire to listen to the problems and the areas in which they can do better. Evidence of that were found when discussing the reasons why user testing has been given a low priority in the Council.

"I think that the problem remains in whether we want to hear something that we do not like. It is not about how costly conducting user testing is, it is about whether we will act on its suggestion or not. Personally I think that getting feedback like this –Inclusivity Metric- gives us perspective on what are the things that matters to users so we can adjust our processes accordingly." (DTM)

## 6.5 The Users' Perceptive

With this main theme, the impact of using Inclusive Design practices is discussed from the perspective of the users. Three emergent subthemes are discussed in this section namely, Trust, Ease of Use, and Service Quality. First, the implications of Inclusive Design and user trust are discussed to show how inclusive e-services generate trust in the users' perception on the organisation. Then, the Ease of Use subtheme is discussed to demonstrate how the users link ease of use with inclusive design, and how that improves the users' perception of the organisation. Finally, the Service Quality subtheme dealt with the effect of Inclusive Design and users' perception of

service quality. These subthemes were generated from the interviews with the users who tested the Insurance Company's e-service. Talking about their experience using the insurance e-service as well as their general insights about using other e-services.

### 6.5.1 Trust

While discussing the challenges of implementing Inclusive Design practices in the Council, and why customers avoid their services. It was reported that the customers do not have a great deal of trust with Council, believing that the information provided by the Councils are either outdated or simply irrelevant (See Section 5.3.3). In order to put things into perspective the users were asked if they would trust the Council if they claimed that the Council's e-services are inclusive and cater to the needs of the users without discrimination. Evidence from one of the users indicate that he would likely trust the Council's e-service if they tried to make it look appealing, which indicates that the Council has spent time and effort to create quality e-service.

> "If the website looks good it will sure effect if I trust the company or not. If the company cared enough they would not publish a lousy website" (S7)

While another research participant stated that the website is an extension to the physical presence of the organisation. Extending the organisation efforts to have an elegant presence that reflect its status to their website in which they are presenting to the cyber world. Thus, if the organisation builds ramps to allow customers will wheelchairs into their building they should follow the same notion in their website by implementing measures that ensure that the website is inclusive.

> "The company's website is part of their presence in the real world, so if they care about the branches ambiance and its accessibility they should do the same for their website" (S5)

Also evidence of website usability and trust were found during an interview with an older research participant who uses the internet more frequently. He concludes that if the website is hard to navigate through that would incite the distrust element in the customers' minds. As customers will either suspect that it is a scam or the organisation does not have a good reputation and they should look for another one.

> "Trusting a website is hard enough for people who do not use the internet a lot. It is even doubled if the website is hard to navigate through" (O4)

Moreover, evidence from one of the older research participant indicate that she cares more about the organisation's empathy to her abilities and others'. Showing they take responsibility to provide equal opportunities to access information and services and not just provide e-services for the customers who know how to conduct transaction online.

> "It is not about my computer skills; it is about how they are being sensitive to people's abilities." (O5)

> "If we can say that this website is inclusive and is thinking about the people who are going to use. Then it can positive impact on our opinions of how trustworthy this company is" (O3)

More evidence shows the link between users' trust and their perception of the organisation's ethics. As demonstrating that the organisation as whole is passionately thinking about its customers' ability to conduct transactions online without the need of other is key to promote trust customers. With e-services the organisation is able to reduce cost as well as empower customers to be independent and be able to conduct transactions by themselves without the need for others regardless of the nature and sensitivity of the transaction.

> "If the company is taking huge strides to ensure that no one is left out whether old or young, able or disabled, we can say that this is an proactive company that appreciates the diversity of its customers" (O6)

> "If they are keen on making sure that I do not miss out on the deals they offer or the information they provide they must be able to present their website in a way that I can use." (O7)

> "I do not see any reason why some websites are horribly laid out. They know that there are older people and people with disabilities who are going to use their website but they continue to remain as they are. It is either that they are lazy or they do not care who is going to use their website" (O2)

Some of the research participants argued that some organisations intentionally make their website difficult so they generate more money, as they charge extra if the transaction is made over the phone. Organisation's greed here is manifested in the organisation website by forcing the customers to pay extra charges for things that should be made accessible for all. If the same notion is replicated in the real world it would incite a great deal of outrage,

for example charging people with disabilities to pay fees to use the accessible bathroom.

> "Some of the websites are made difficult on purpose so customers can miss out on some deals or buy unnecessary products. For example, some airline companies have such a difficult interface so the customer would have to call them and pay for service fees" (O7)

### 6.5.2 Ease of Use

This subtheme emerged from discussions about the impact of the level of ease of use that the e-service provides. Within this subtheme older research participants reflected on how ease of use can improve their interaction with technology. This subtheme looks at the main issues about ease of use that older adults have when using e-services. Given that the constructs of the Inclusivity Metric highlight the main drivers of ease of use in an interaction.

The ability to perform tasks on the internet was deemed very important to older research participants to ensure that they stay independent, as shown in the evidence below. The person's desire to stay independent stems more than their ability to run errands around the house it goes also in their ability to use computers without the need to rely on others. A response from one of the research participants illustrates the issue.

> "I want to be able to use the website without having my grandsons to do it for me. I do not want to be a burden on anyone. I mean I take care of everything in the house" (O8)

Expressions of self-doubt is always present during every conversation about their ability to perform tasks online. Even if it was

said as joke, it still shows how older research participants doubted themselves before doubting the technology they were using. On one occasion the research participant clicked on the button correctly but the website froze momentarily but instead of waiting for it to start again he raised his hands to state that he was unable to press the button and he required assistant. Another evidence was when the discussion about making technology that are specially designed for older adults, the participant jokingly suggested that she cannot use technology if it was made for older adults even though she was able to perform all task with any assistance from others.

> "It can be embarrassing as well if it is made for us and can use it anyway [Laughs]" (O2)

Inclusion in the design process was also one of the things that the research participants thought would make the designers more compassionate to users' abilities. Agreement across the interviewees was apparent when one of the research participant brought the idea of user involvement in the design process.

> "If people with different capabilities are included in the design of these websites, I think we will be able to widen the focus of the designer" (O7)

Being able to understand how users interact with the e-service is key to determine the best way a certain process can be achieved. The comment above also resembles the User Interface Designer's comment in mentioned previously about user involvement when discussing the problems faced by designers while selecting the terms used in the e-service (See Section 5.5.3 Terminology Selection).

> "The problem resides in our inability to involve real users in the design process of even conduct user testing for our prototypes." (UID2)

When asked about the reasons why some websites are hard to use from the user's perspective. It was evidenced that there was lack of trust among research participants that the designers are think of their capabilities while they are designing websites. One of the research participants expressed astonishment about the state of usability in some websites:

> "You would think that designers want everyone to go to their website, it is a puzzle to me why would they not consider that there are people who are either new to this or have health problems that affect their experience while they are online. Honestly I think that is just pure selfishness." (O6)

This lack of trust is not beneficial for improve older adults' perceptions of the internet usability and its applicability to solve their issues. As it reinforces the feeling that technology is not suitable for them. Therefore, assurance that a particular website has been created with the focus on inclusivity and ease of use is necessary to remove feeling of inability to perform the task.

> "With this tool we can demonstrate what matters to us, and make our voices heard" (O7)

Another evidence demonstrate that older adults do not fear using a computer, as some studies suggest. It is more about the complexity of some websites especially when there are distracting advertisements and flashing colours. Limiting the sources of distraction is important to ensure that the user's attention is

maintained especially when inputting sensitive information. So it is inferred that keeping a simple website with minimal animation could reduce complication and therefore result in easier interaction. The evidence below demonstrates how the research participants felt about the pop ups and the advertisements during their interaction with the Insurance Company website and other websites.

> "It is not that I afraid of computers, the problem is that some websites are too complicated. I feel bombarded with images popping here and there, to the point that it I do not know where to click to close the window" (O7)

> "I lose the will to live every time I get send off to other websites, whenever I see advertisement pooping on my screen I just close my computer" (O4)

Evidence also suggest that the interface should provide the flexibility to be operated in different platforms without reducing the quality of the interaction. Especially with touch based platforms that require higher dexterity to be able to click buttons and input information. So in order to ensure that the interface is suitable for all user groups the buttons should have a decent size to allow users to interact with them easily with the need to rely on others to perform tasks. Especially since tablet and smartphones are growing exponentially among older adults.

> "I go on the internet on the tablet that my son gave me, and it is very difficult to read some of the websites and the buttons are too small to press" (O3)

Even if when using a mouse and a keyboard, the interaction can be very difficult when the users suffer from illnesses that hinder

their ability to select items on the screen. Thus making elements on the screen visible with sufficient space to click and input data in. During the interviews two of the older research participants expressed her frustration with while inputting the data in, citing physical constraints and their effect on their experience while using some websites.

> "I have arthritis and it is very difficult for me to move the mouse to click on these small boxes in the website. I do not think that it would harm them to make the buttons a little bit bigger" (O1)

> "I do not want to grab a magnifier glass to be able to click on a button, just make the text a little bit bigger so I able to read it comfortably, even my granddaughter who is 15 sometimes struggle to so what is written in some of these websites" (O2)

Moreover, simplicity in the way instructions are described is important especially for critical services that can affect their life or their financial arrangements. Evidence also confirms with the need for terminology selection effort that the Local Council has embraced during the implementation (See Section 5.5.3 Terminology Selection). One of the research participant complained about the complexity of some of the terms used in the websites he interacted with before:

> "They need to write stuff down in plain English, not that weird words that do not mean anything" (O5)

Ultimately, it was inferred that if the interaction is was difficult older adults are willing to forfeit the benefits of technology and rely on other methods that do not make their experience stressful. It was observed during the usability testing that two of the older research

participants were debating whether calling the insurance company directly would much easier than doing the transaction on their own. In the interviews they were asked if they would do similar transactions online the next time, one of the research participant responded with:

> "If using a computer will make the task longer and more stressful, then I would rather go visit them or give them a call. The whole purpose of computers is to make our lives easier and not complicate them." (O8)

There was a feeling of mistrust of the organisations' intention through the use of complicated navigation schemes and complex language. The feeling that the organisation wants to fool them into buying unnecessary services is one of the main drivers that older adults avoid the internet. Moreover, some feel that websites are made complicated in purpose so they are directed to call and pay service charges. This was inferred from comments made by two research participants who voiced their concern about the state of complexity some website are in.

> "I saw some beautifully made website that are not very difficult to use, and some where I feel that people who made it was determined to make the website so difficult to use. Which is bizarre because no one wants to make people not use their services" (O7)

> "I am all for a beautiful website, but it does not have to come at the price of its functionality. What am I supposed to do with a beautiful website that I cannot use?" (O6)

## 6.6 Analysing Themes

In this section the main themes are analysed to interpret the issues raised in response to the Inclusive Design cycle conducted in the Council. This helps to highlight how the issues raised in the Discovery Phase of the Action research cycle were addressed in during the Action Phase.

### 6.6.1 Impact on Local Council

In reflection to the effort done to create an inclusive e-service, the team in the Council acknowledged the impact of Inclusive Design strategy on the overall design process. From the evidence demonstrated above how the Council did not truly been designing with the user in mind as they always stated. The lack of user involvement from the beginning of the project really affected the usability of the e-service designed by the Council. The main driver for the project was to develop the e-service as fast as possible with little regard about usability or inclusivity. Thorough the discussion and the results of the Inclusivity Metric it was noticed that user involvement is a key issue that affects the usability of the e-service. User involvement needed to take place in order to see how the e-service will be used and provide feedback on how they can improve the interaction. The findings also suggested that the quality of the e-service took a step back due to the team's commitment to produce the e-service on time instead of producing an inclusive e-service. It was necessary to address the main project management issues before carrying on with the project as these issues had negative impact on the design process. The project suffered from scope creep that compounded the amounts of requirements of the e-service, resulting in sacrificing usability to basic functionality. That also resulted in removing user testing from the design lifecycle which ultimately lead to the e-service scoring low in the Inclusivity Metric. Moreover, the findings show that with the lack of user advocacy in

the project team, the users' voice in the system development is diminished resulting in the dominance of the designers' opinion on the usability issues. Even though designers are experts in their field they still need users' input to improve the designs, especially since they are the ones who are going to use the e-service.

In terms of the design lifecycle issues, the application of Inclusive Design lifecycle as well as the Inclusivity Metric enabled stakeholders from different professional backgrounds to communicate with one another to bridge the gap between ICT professionals and Social Care professionals. This enabled them to brainstorm better ways to tackle the Care Act requirements. This also created a sense of ownership among the design team, which allowed the Social Care staff to actively participate in the design sessions to improve the e-service as this will reflect late on their job performance. This empowerment exercise allowed the Social Care staff to critically think the e-service elements and negotiate the improvements to the e-service. Also it was an opportunity to demonstrate the progress of the design team with the Senior Management showing them how well these changes are taking affect and whether the e-service that is being designed will able to fulfil the usability needs of user in response to the Care Act.

### 6.6.2 Impact on Customers

In terms of ease of use and its implications on the user perceptions of trust, there was evidence from the interviews and usability tests that suggest that easy and simple interfaces are believed to be more trustworthy compared with complex interfaces. Simple interfaces show that the organisation has put a lot of effort to allow users to interact with the organisation conveniently. Thus,

reinforcing loyalty towards this organisation as this shows how committed they are to engage with their customers.

Moreover, the interface of the organisation website is an extension to their physical presence. So it carries the same importance of preserving the organisation's image. If the organisation was in bad building with old furniture and unwelcoming atmosphere, the customers would feel uneasy to deal with this organisation. As it shows that the organisation does not care about the image that they will leave in the customer's head. The same goes for website and e-services, if the organisation did not pay attention to the state of the website, customers will not trust that organisation with their transaction. Therefore, the same consideration about the aesthetics of the website should be taken seriously. Not only have that but the content of these webpages needed to be updated to reflect the organisation's commitment to provide reliable information to its customers. This enables customers to trust the information provided in the website and not second guess every transaction they make in their website. Especially in the case of the Local Council which already is not deemed trustworthy by its constituencies (See Section 5.3.3 Creating Awareness).

Furthermore, having a complex user interface has can have negative consequences on the customer's attitude towards the sensitivity of the organisation towards people with reduced mobility. There should be a balance between designing websites for older adults and the people with reduced mobility and designing while being considerate that older adults should be able to use the website easily. There is difference between both notion as the former can carry negative effect on the users' perspective as some would view it as condescending, especially when they do not associate themselves as an "older person" or "disabled". The latter shows that the

organisation does not look at age or disability as barrier to use their website and that the organisation encourage equal treatment of all its perspective customers. By optimising the interaction and choosing the elements in the interface that provides the lowest level of effort while interacting with the e-service. The feeling of distrust that some websites are made purposefully hard to let customers who are not familiar with technology to use other platforms to benefit from the service fees they charge has to be addressed by improving the designs of some e-services. This notion comes from the feeling of inequality just because the costumer does not possess the needed skills or ability to do the transaction online.

## 6.7 Summary

In this chapter, the development and the testing of the Inclusivity Metric were shown. First the development of the constructs of the Inclusivity Metric was discussed, showing how to calculate each construct to create the Inclusivity Score which correspond to the level of inclusivity of the e-service to be evaluated. Then, to test the Inclusivity Metric ability to capture the inclusivity levels of e-services, the Metric was used to evaluate two e-services namely the Council's e-service which is the main focus of this research and the Insurance Company's e-service to serve as a base for comparison. The reason behind choosing the Insurance Company was the inability to test the Council's e-service on users outside the Council since it was fully completed. So the Insurance e-service was used to show the difference between it and the Council's e-service to the design team, and to test the Inclusivity Metric on users outside the Local Council.

The Inclusivity Metric showed the differences in the constructs that have been evaluated by the users group. Showing a relatively similar results between the younger user group and the design team

in terms of overall inclusivity. While the older users were lagging in all the constructs of the metric which in turn reduced their score of the e-service that they tested. The Metric gave the design team an opportunity to look at other e-services to find out the best way to achieve inclusivity and the elements to avoid while designing an inclusive e-service. Moreover, it gave the design team an opportunity to see was users look for in the design while comparing the results from the Insurance Company's e-service with the results that they conducted for their e-service.

# Chapter 7: Discussion

## 7.1 Introduction

In the previous chapter, the impact of employing Inclusive Design practices was discussed. Showing the impact on both the design process as well as the impact on users. This chapter discusses the results in light of the literature review in order to demonstrate how the research questions were answered by this research. This will pave the way to highlight the research contributions in the final chapter.

## 7.2 The Conflicting Point of Views about Inclusive Design

One of the main issues discussed in this research is the way that Inclusive Design was perceived by designers and users. It was apparent that a very narrow definition of Inclusive Design was followed by the design team in Local Council, Inclusive Design does not just stop at designing bigger icons and using large fonts. Inclusive Design should be thought of as design philosophy that focuses on the users' needs and build a system around these needs and capabilities (Newell and Gregor, 2002). Therefore, an active involvement of users is key to ensure that Inclusive Design will be able to fulfil the needs of the users as well as allow them conduct transaction independently. However, as stated previously in Chapter 5 the design team was delaying involving the users partly because they did not have sufficient time for it and they did not want lose time on the logistics of including users in the design team. However, it does not stop only on involving the user the Design Team has to be open for suggestions and feedback, these findings confirm the research done previously that links design success with user involvement (Lindsay et al., 2012; Ogonowski et al., 2013). Reflecting on the research findings the Design Team was not willing to add more work by taking users' feedback as the project was already under pressure to finish as

quickly as possible. This research demonstrated the value of the user involvement to the Design Team, by showing how the users' feedback in the usability testing with other e-services generated many fruitful ideas that can help the Design Team to improve their designs and their inclusivity.

Many factors affect the implementation of inclusive design, especially since designers often design for themselves This results in some poorly designed e-services that does not consider the population as whole focusing on system's requirements instead of the users' (Lim, 2010). This has manifested itself in the way user interface elements were designed. The overwhelming attachment to aesthetics have skewed the designers' focus on what matters in an e-service.

Moreover, this research continues on the work conducted about Inclusive Design by improving the Evaluation Phase by introducing the Inclusivity Metric to evaluate the designs. This Metric came as an answer to the growing confusion about the Inclusivity of certain designs, the Metric allows the designer to evaluate the design in terms of usability criteria to produce a numeric value to indicate the Inclusivity level of that design. The findings confirms the previous research conducted about Inclusive Design which state that Inclusive Design should be looked at as a design philosophy rather than a mere guideline (Newell and Gregor, 2002). In addition, it added a new inclusivity testing mechanism to allow the designers to evaluate their designs against the inclusivity criteria. This addition to evaluation tools can provide the designers with large variety of tools to evaluate the design and extend tools used in previous research (Cardoso and Clarkson, 2012; Welle Donker-Kuijer et al., 2010; Zitkus et al., 2013).

## 7.3 The Enablers and Disablers of Inclusive Design in the Local Council

After conducting the research, a clearer picture was made about the actual enablers and disablers of Inclusive Design in the Council. Chapter 5 highlighted the Council employees' perception of what are the challenges that they faced while adopting Inclusive Design Strategy. It was mainly categorised into two groups, the first focused on Project Management issues that derailed the adoption. The second was focused on design issues. However, there were more issues that has not been mentioned by the participant but was evident during the implementation.

These hidden issues were working as enablers and disablers of implementing an inclusive e-service. This dynamic allowed the Council to be able to create this e-service with minor issues that derailed their progress. The effect of these issues is discussed in the following sections.

### 7.3.1 The Organisation's Technology Orientation and its effect on the Design Process

One of the main points to be discussed in this research is the effect of the organisation's technology readiness. Many of the research participants stated that the Council was treating ICT as process automation tool rather than a strategic asset to enable the organisation to attract as many customers as possible with the lowest costs. If ICT was indeed a strategic asset in the Council more effort will be done to ensure that the e-services provided in the Council are of high quality. Moreover, more effort will be placed to make the e-services easy to use and provide a convenient interaction with the organisation. This important because many studies looked at the strategic alignment of Information Systems in terms of budget

allocation and system success (Chan et al., 1997; Segars and Grover, 1998; Venkatraman et al., 1993), this research looked at the implications of strategic alignment on the design effort.

In the case of the Council, it was obvious that the senior management acknowledged the benefit of ICT to save costs and serve their customers. However, they were not motivated to invest more in ICT nor did they include the ICT managers in the senior management decisions. The Senior Management beliefs about the value of ICT to the Council has more consequences on the way the organisation treats its ICT projects. It was obvious during the project that Senior Management wanted the e-service to be live as soon as possible, without any regard to the quality of the e-service. True belief of the value of ICT has good consequences on the quality of the service to be provided, as it is considered an extension of the organisation's presence in the World Wide Web (Delone and McLean, 2003). Accessible and easy interaction with the Council's e-services should be dealt with in a similar way that the Council design their buildings so they are accessible by all the customers. It is not the organisation's commitment to using the state of the art technology in their day-to-day operations that helps the organisation to attract more customers and satisfy all their needs. It is the way that the organisation's uses technology to aid customers to conduct their transaction easily and provide them with valuable yet accessible information (Christopher Sze Chong Lim, 2010). It is worthless if the information is available on the website but customers are unable to access them due the complexity of the website. The organisation's value of ICT is also reflected in the way they treat and manage their webpages. One of the main issues faced by the Council was the overwhelming number of webpages created just for the sake of having a webpage. These webpages were often neglected and the information provided there were either outdated or does not add any

value to the Council's website. The lack of management and ICT strategy was one of the main contributors to low quality webpages in the Council's website. This also links to the Council's perception of ICT and its role in the Council's operation, the issue here should be about the quality of the pages instead of the quantity (Chu et al., 2012). The information provided in these webpages should aid the customers to make better decisions and be up to date with the current services that the council offers. Therefore, the accessibility of the e-service should not just be open for the interpretation of the designers, it should be unified across the website. The design of the website or e-service is a task of huge importance to the organisation and should dealt with carefully. Moreover, the design process should inclusive of all the people involved in particular project. It is crucial to involve the right number of participants so it become easy to manage the team (Ogonowski et al., 2013). Especially since having a large number of participants in the design team can lead to delays and perhaps participants with no clear task to do (Scariot et al., 2012).

One of the great advantages that the Care Act Project had was the collaboration between employees from different departments, all of whom had different feedback to improve the process. This diverse design team was able to pick up different issues and suggest improvements that the Web Developers did not thought of. This also helped to create a sense of ownership to the project, which helps in the system buy in once it goes live. However, this needs to be taken one step further to include customers so they can part of the design team. This helps to provide feedback on what the customers look for in the e-service, especially since the employees are already aware of the process and they cannot anticipate how the users might react to certain questions (Vines et al., 2013). This inclusion of participants can also help during the usability testing of the e-service. Seeing how

the users interact with the e-service to understand where the areas that they struggled with the most and what are the areas that they were able to use. Without users involvement the design team has to take educated guesses on how the users will react while filling up the forms in the e-service. It is not just about conducted user testing, the organisation need to be able to take these recommendations and implement them in the following design sessions.

### 7.3.2 Users' Involvement Impact on Inclusive Design

This research agrees with previous studies that looked at the impact of end user inclusion in the design process (Kim and Kankanhalli, 2009; Lindsay et al., 2012; Ogonowski et al., 2013). End user involvement should not be left at the end of the design process to just to confirm whether the requirements have been met. Users and specifically older adults should be consulted and involved throughout the design lifecycle, this allows the designers to have some empathy towards the needs of this user group. It was noticed during the design sessions that the designers were preoccupied with the requirements of the system opposed to understanding the requirements of the users.

The design team did however include a wide range of experts that deal with social care issues, like Social Workers, and Legal Consultants. These non-ICT team members provided a different perspective to what should be included in the e-service and how. The designers' openness to suggestions was refreshing to witness, as they all were immersed into the creation of this e-service that would provide users as well as social workers the flexibility and freedom to select the social care plan in a fraction of the time (Abelein and Paech, 2013). Many issues were picked up by social workers who tested the system for functionality as well as its usability, due to their long term experience with older adults and users with disabilities. The

involvement of the non-ICT professionals has become the norm in system design to create a system buy-in and to ensure that the requirements are met sufficiently (Bano and Zowghi, 2015). This allows a more democratic design process were all parties that will be affected by the e-service can shape the interaction and the functionality of the system. Moreover, they can see why some features that they would like to see in the e-service cannot be included due to its inappropriateness and vice versa.

On the other hand, other sources of requirements were not involved in the design sessions. Nor were there any form usability testing apart from the one conducted by the researcher to test the e-service compatibility with older adults' needs. Throughout the design sessions there was very few conversations about the users' needs that has not been initiated by the researcher. During interviews the team members would express that users are the main source requirements and that users always come first. However, during the design sessions the system and the Care Act requirements were the main source of requirements. While it is justifiable that the Care Act should define the main functionality of the e-service, it is however the users who define the usability of the e-service at hand (Abelein and Paech, 2013).

In order to understand the results presented in the previous empirical chapters the reason for the focus on functionality rather than usability during the design of the e-service, was the design team pressure to finish the project in time of the launch date of the Care Act. Thus, a lot of the usability decisions made during the design were to have a functional e-service and then let the usability issues for later. These usability issues were pushed back until the launch date were the design team would later test the e-service with older adults to evaluate its compatibility. Unfortunately, no user testing was

conducted after the e-service was launched and the e-service remained as it is with the exception for minor aesthetic modification. The user involvement was thought of as an elective step that can be substituted by involving social workers who understand the needs of older adults. Even though the Social Workers have provided important suggestions they still cannot substitute the feedback they could have received from actual users (Bano and Zowghi, 2015).

There should have been more emphasis from the design team to include older adults and other users from the beginning so they are able to understand and demonstrate the usability of the feature they intend to introduce in the e-service. It was obvious from the results of the study that the Council was not fully ready to include end users and especially older adults due the logistical issues that they would bring to the project. Therefore, they chose to avoid the hassle by eliminating end user involvement. Even tough that the benefit of the inclusion is advised and known to have lasting positive effect on the e-services usability (Scariot et al., 2012). The findings of this research confirms previous studies arguments about the benefits of including users in the design process (Astbrink and Beekhuyzen, 2003; Ogonowski et al., 2013; Vredenburg, 2002). Especially since the Inclusivity Metric results showed that it scored lower even though it was just test by the design team. Especially since the e-service was designed by younger designers who do not suffer from any age related issues that can hinder their experience while interacting with the e-service. Therefore, the inclusion of older adults in the design sessions would have been beneficial to capture the needs of this user group and accommodate them in the final design.

### 7.3.3 Detachment from pre-existing design norms

One of the main disablers to Inclusive Design in the Local Council was the Design Team's attachment to the previous design norms. Particularly, the functionality of the system they were using before. The emphasis was put on making sure that the functionalities to be provided in the e-service are compatible with the legacy system they are using. It was observed during the design sessions that none of the designers wanted to change anything that cannot be supported by the legacy system that interfaces with the e-service. Even if it is considered an improvement to the usability of the e-service. Whenever there was a suggestion to change certain things to improve the usability were always delayed until the launch date. This attachment to the legacy system and the design norms in the Council has effected the usability of the e-service which was evidenced by the poor evaluation in the Inclusivity Metric. Designers need to step back and evaluate the worthiness of these restrictions to see whether they are cumbersome to the e-service's usability and would make the interaction with it difficult for older adults who will constitute the majority of the beneficiaries of the Care Act.

The findings of this research highlights the 'short-sightness' of the design team to focus solely on the legacy system and not the needs of the potential users which also agrees with over studies presented in the literature review chapter that coins ICT projects' failure to the lack of focus on users' needs (Gould and Lewis, 1985). Many studies suggested that Ease of Use is one of the main enabler to technology acceptance, therefore more emphasis should be placed to ensure the technology is easy to use (Abdullah et al., 2016; Allahyari et al., 2012; Liu et al., 2010; Parayitam et al., 2010). Especially if the users are not all computer savvy or might have conditions that might affect their interaction with the e-service.

Moreover, this attachment to the legacy system severely affected designers' creativity as they were always reminded to stick to the way that it has been done in the legacy system. Even though the project was set out to be the model for future designs. Of course, this attachment meant that they could produce the e-service faster in comparison to developing ab e-service with end users and reflect on their needs (Abelein and Paech, 2013). But it was apparent in design sessions that the design team did not have enough time to freely experiment of alternative designs and more importantly test the system with actual end users instead of the design team themselves .

## 7.4 The Effect of the Inclusivity Metric

This section discusses the effect of the Inclusivity Metric on the design of the e-service. This section is a reflective section in which the effect of the Action research is discussed to understand how these action has led to a change in the current design practices in the Local Council to ensure that the ICT design will allow users to interact with the Council regardless of their abilities or age. Firstly, the effect of the Inclusivity Metric will be discussed to show how the Inclusivity Metric was able to influence designers to properly incorporate design features that improve the usability of ICT products.

The effect of the Inclusivity Metric is localised in two areas: design evaluation, and knowledge transfer. The effect of the Inclusivity Metric on design evaluation is more straightforward as the main the function of the Inclusivity Metric was to evaluation whether the design is suitable to be used by as many users as possible. With the application of the Inclusivity Metric this evaluation is materialised in a way that allows the designers as well as other stakeholders to see how their websites or e-services are able to satisfy the needs of users regardless of their abilities. What was different about this

Inclusivity Metric was that it can be used by both experts like user interface designers and non-experts like end users and non-ICT personnel unlike other evaluation tools that only can be used by experts (Hwang and Salvendy, 2010; Nielsen and Molich, 1990). This ensures that the voices of non-experts are properly incorporated in the design evaluation. Which is a departure from Heuristics Evaluation proposed by Nielsen and Molich (1990) in which only experts were invited to evaluate the user interface. While they do provide insights on the important issues in the design, end users also should be considered during the evaluation to first voice their needs and confirm whether the user interface is easy for them to use. This was evident in the difference between the end users' and the expert users' evaluation of the Insurance Company's e-service, where the users were scored some of the constructs of the Metric lower. The results can start a conversation with the experts and the users to validate the results and evaluate the necessity to perform further upgrades. Moreover, this dialogue between users and designers is the base for more fruitful engagement with users and especially older adults. As many studies have shown that older adults are not always consulted during system development projects unless it has to directly with older adults (Cardoso and Clarkson, 2012; Vines et al., 2013). By incorporating them and discussing their feedback using tools like the Inclusivity Metric, future developments and alterations can be reduced. The main goal here is to widen the designers' horizon and open their eyes to a new way of doing things.

In light of the literature, this research has demonstrated how Inclusive Design is implemented to address the diversity of users' abilities. The Inclusivity Metric was used in this research to ensure that the design team think about users' abilities and propose designs that are compatible with people's abilities, which in return can allow all users regardless of their age to use ICT and therefore bridge the

age-based digital divide trough Inclusive Design. This research proposes a check-up point to step back and evaluate the designs so they are less intimidating for older users, through improving design strategies that promote easy to use interfaces. Especially since a lot of studies in technology acceptance coin ease of use as a main determinant to technology use (Abdullah et al., 2016; Allahyari et al., 2012; Liu et al., 2010; Parayitam et al., 2010). Thus this research outlines the main features of the interfaces that makes the interaction easy to use not only to older adults but to all other age groups. As the results show that if the older adults were able to use what other user groups were able to use it with no compromise in the functionality or aesthetically. The results of this research shows that there is no need to design exclusively for older adults, as Inclusive Design can facilitate ease of use and therefore different user groups can use it. Without the need spend more resources and effort to design different versions of the e-service. The result will benefit the organisation financially and more importantly ethically. The financial benefit is straightforward as Inclusive Design means that there will be no need for further development to ensure that design is suitable for older adults. The ethical bit is what needs to be more emphasised, it is a moral obligation to ensure that the e-services and websites are inclusive of all users groups as they have the right to access information and interact with governments and businesses alike freely and independently. The goal of technology should always be facilitator and promoter of quality of live, therefore it should be designed for the users (Abascal and Nicolle, 2005). This means that the users should be the main source of requirements during any systems development project. The Inclusivity Metric then be used to demonstrate that the organisation has been keen on ensuring that its products are designed for everyone, this in return can show the moral fabric of the organisation and its commitment to bridge the age-based digital divide. If this result of the metric is made public and

shown in their website this can encourage other websites to follow their lead. Moreover, with the results of the Metric shown in websites, the public can demand better Inclusive Design practices for any organisation.

## 7.5 Reflections on other projects

The findings of the research also reflect on other projects that was carried out by the government that failed to provide inclusive e-service. One notable resemblance is the case of the Affordable Care Act in the United States, where the federal government tried to lunch an e-service that captures citizens' information and healthcare needs to be stored in central database so that citizen with no health insurance can receive benefits from the government. On the first day that the e-service was extremely slow and crushed repeatedly (Baker, 2014). Very few people were able to complete the transaction with the website, and more importantly the interaction with the website was very difficult. This has sparked national debate about the worthiness of ICT in the field of healthcare, where many citizens expressed their lack of trust for a faceless system that will take their private information. Of course this was also influenced by politics, where the Republicans in the US were fighting such legalisations and they were eager to find loopholes in the system to brand it as a failure from the start. Regardless of the political resistance, the e-service failed to fulfil any of the usability issues raised in the literature or the Inclusivity Metric. The e-service was very complicated, using sophisticated medical terminologies that are difficult for lament person. Furthermore, the process in itself was very complex as users had identity pre-existing medical conditions then answers questions about it and then repeat the whole process for each condition. Also, the e-service did not inform the users of all the information it required. There were some reports that users were asked to provide certain information that would require them to leave the e-service

and by the time they were able to retrieve this information their sessions would be already expired, resulting in redoing the process again if they were lucky enough to load the e-service for the second time (Pipes, 2016).

There are a lot of similarities with the Affordable Care Act in the US and the Care Act in the UK, they both are considered a big change in the way government provide services -in different sectors- and both relied on ICT as medium to allow the citizens to register their information and request services. However, the difference lays in the political agenda of some of the opponents of the new legislations as some politicians in the US were attacking the legalisations using the e-service as a way to demonstrate the US government's incompetence through the failure of developing "a simple e-service". However, the truth is that this e-service is ought to be complicated due the nature of the field. This nonetheless does not warrant the design team to not try to simplify the interaction and make what seems to be a hectic interaction to a more pleasant experience.

## 7.6 Answering Research Questions

To summarise the discussion in terms of the research questions proposed by the by this research, this section will organise the analysis of the findings in terms of their relevance to the research questions.

**Research Question 1:** What are the main challenges of adopting Inclusive Design practices in an e-government context?

The analysis shows many issues that hinder the implementation of Inclusive Design in the government context. First is the technology orientation of the government organisation. An organisation that does not perceive technology as main pillar in its

strategy is less likely to design an e-service that fulfils all the usability and inclusivity requirements. Only when technology play an important role in the organisation strategy Inclusive Design can be implemented in an effective way. If the organisation does not value technology it will not invest in improving its e-services as they will depend on other platforms to deliver their services (Chan et al., 1997; Segars and Grover, 1998; Venkatraman et al., 1993).

The research demonstrated that Inclusive Design in HCI does not only revolve around simple designs and larger text, Inclusive Design should be thought of as an overall design philosophy that merges the organisation's strategy with the design lifecycle (Newell and Gregor, 2000). This alignment is the main driver for inclusive design, especially since with this alignment will result in a tougher regulation and management of ICT as one of the main assets of the organisation.

These issues can be summarised into two main challenges that affect the adoption of inclusive design. The first issue is the project management of the organisation, the way that the project was managed made the adoption of Inclusive design very difficult. It was obvious from the results that the incorportation of older adults in the design stages is a main contrubuitor to an effective Inclusive Design strategy. Especially since the inclusion of older adults as well as other users can promote empathy to users' needs, therefore the apporprtaition of these needs in the final design (Abelein and Paech, 2013). Moreover, this user group is growing exponancially, thus it is important to ensure that they will be able to use the wesbites and e-services provided by any organisation. As this will allow the organisation to tap into an important user group, as well as allow older adults to perform all transaction at ease of mind and more improtatnley indepedently.

The second issue, deals with creativity and the attachment to legacy systems or design strategies. With the rise of user-cetentred design appraoches, the attachment to legacy system is one of the main this that hinder the adoption of Inclusive Design. This is due to the design team being preoccupied with the previous system capabilites and what it used to offer, and not what the users are expecting to see in an e-service in the 21st century. Within this project many of the ideas were postponed or rejected just because they did not conform to the system that the Council already invested in. This issue does not only revovle about the financial investment the Council have put in the legacy system, but also to the effort and cost of training their staff on the new system they would had in place.

However, if the system has high usability standards than this problem would be avoided, since the there would not be higher training cost as the e-service would be easy to use by the majoirity of the users including the Social Workers who already possess knowledge about social care issues (Keates et al., 2000). Freeing the designers from these constraints and allowing them to be creative in responding to users needs would allow the organisation to attract this user group as well as show their ethical standing and their committement to provide accessable e-services to as many users as possible (Abascal and Nicolle, 2005). This of course should through including diverse set of users early on in the design while promoting the Inclusive Design principles through out the implementation.

**Research Question 2:** How can Inclusive Design enable bridging the digital divide by improving person-technology fit?

As demonstrated in this research as well as previous studies, ease of use is one of the main determinant of technology acceptance

among older adults (Abdullah et al., 2016; Allahyari et al., 2012; Liu et al., 2010; Parayitam et al., 2010). This research was able to demonstrate what is meant by ease of use in terms of the features of technology that facilitate ease of use. What is different in this research compared with the previous research is that the notion of ease of use is put into actual and measurable features that enables designers and researchers to gauge these elements and observe how these elements can change the users' perception of the technology's easiness.

Going back to the Inclusivity Metric, the results showed that the technology's logic and its closeness to reality is one of the main drivers that promote usability of e-services and websites. Through the application of the Inclusive Design principles the gulf between the real world and the digital world can be bridged, this is done through ensuring that the interaction in the real world is reasonably reflected in the digital world. Subsequently if the user understand how things are done in the real world, they will not face any problems conducting the same task online –or at least with minimal effort- So the e-service should provide visual and audio cues to inform the user about the nature of the question. The user should be able to understand the context of the question without having to read everything on the page. The questions should be self-explanatory that the users do not have to check with others for help. The notion of affordance applies in here where buttons and icons are used to convey information about what the user needs to do (Norman, 2010).

Based on the discussions with older research participants, technology should not intimidate users with cryptic use of language that would interfere with the users' understanding of what is required from them. The results of this research shows that using simplified language can improve the ease of the interaction significantly. The

avoidance of jargons and complex words has been deemed very important to improve the users' confidence particularly older user. Being able to understand the requirements of any e-service is key to the transaction's success (Nielsen, 1994b). Moreover, the clarity to which information is presented in websites is very important to ensure that users regardless of their educational background can understand the information provided in the website.

Moreover, the website or e-service should be able to prevent users from making errors and if they happen it should aid them on how to correct these errors clearly and more importantly with dignity. Especially since errors are inevitable so there should be a robust strategy on how to handle them (Nielsen, 1994b; Norman, 2005; Shneiderman and Plaisant, 2004). When users interact with a lengthy e-service they do not want to repeatedly correct their mistakes, especially when they are dealing with sensitive information. First, there should be a clear indication to what type of data each field accepts, as well as a help option to inform the user about the question and provide exemplar responses. Second, as soon as the user inputs the data the e-service should instantly validate the data so the user can save time while interacting with the e-service, as well as assure users that they are inputting the correct data in each field. Especially since fear of committing a mistake is one of the main drivers that forces older adults to avoid technology. Finally, after a mistake is identified the e-service should provide clear information about what happened and where the mistake was recorded, and more importantly how to resolve the error without making the user feel bad about committing an error.

Furthermore, the website or e-service should not rely completely on colours to convey information. Since as stated before people who have difficulties viewing a certain colour cannot be

disadvantaged. This does not mean that the designers should abandon all aesthetics consideration while designing an inclusive e-service, it means however that colours should be used with care so they do not distract or limit the number of users who want to use the e-service. Minimalist design in which colours and graphics are used in elegant way to make the interface look pleasant, is the optimum way to tick all these boxes in terms of presentation (Keates et al., 2000).

Also, the flow between steps in the e-service should be logical. This means that users should be able to understand what each step require, and what is expected next after the completion of each step. Moreover, the e-service should inform the users about the special information it requires and an approximation of time to complete the transaction. This way users can plan ahead if they want to continue with the e-service to do it in another time. This also allows them to find any documentation they might need ahead of the transaction so they can save time and effort whilst using the e-service.

Finally, Inclusive Design should adhere to all the accessibility requirements stated by W3C in order to allow people with disabilities to use the e-service easily without requiring help from others to interact with businesses or government (Zitkus et al., 2013). All of these points that make a design inclusive will ultimately ensure that technology fit the users' needs and capabilities. Contrary to the notion users have to adapt to the technology so they can use it, technology will fit the users' capabilities and therefore will not require further training or adaption process for older adults to use it.

## 7.7 Summary

This chapter discussed the results of the empirical chapters of the thesis in order to answer the research questions that the thesis

has raised. First the chapter discusses the conflicting definitions of Inclusive Design, highlighting the narrow definition of Inclusive Design that the design team had prior to implementing the project in the Council. After that, the chapter points to the enablers and disablers factors of Inclusive Design in the research context. These factors include: (1) the organisation technology orientation, which argues that for an organisation to be open to inclusive design it has to value the importance of technology to its strategy and day to day business; (2) involving users in the design process, which discusses the benefits of incorporating users from different walks of life and capabilities so the designers can appreciate the diverse capabilities of the users; and (3) detaching from legacy systems, where the designers creativity is capped to the capabilities of the legacy systems and design conventions that are outdated, this would result in focusing on system's needs instead of the users' needs. Then, the chapter reflected its findings on the Affordable Care Act project in the US, where the design of a complicated e-service to capture citizens' healthcare information led to an outrage due to the complexity of the e-service. Finally, the chapter outlines the findings in light of the research questions raised in the beginning of the thesis to demonstrate how this study has been able to fill the research gap.

# Chapter 8: Conclusion

## 8.1 Introduction

In this chapter highlights the recommendations to tackle the problem of the age-based digital divide. Given the changes in demographics as well as the raise of online services by governments and businesses alike. These recommendations that focus improving inclusive design practices to improve the technology-task fit and ultimately provide inclusive e-services. This chapter first highlights the theoretical, and practical contributions of the research. Then, it demonstrates how transferable the findings of this research to other fields. Finally, it discusses the limitations and future directions to allow other researchers to expand of the issue of the digital divide.

## 8.2 Contributions and Implications

In this section, the contributions of the research are outlined to demonstrate how this research helped to advance knowledge from theoretical, and practical.

### 8.2.1 Theoretical Contributions

This research extends the notion of ease of use proposed in TAM, by looking at the challenges that hinder ICT designers from developing easy e-services that enable various users from using ICT. It highlights the deeper issues that when designing e-services that are intended to target as many users as possible. A lot of research have looked into the antecedents that promotes usage of ICT, but very few have developed deeper understanding of these antecedents. Ease of Use has been one of the main antecedents in many technology acceptance theories (Abdullah et al., 2016; Allahyari et al., 2012; Liu et al., 2010; Parayitam et al., 2010).

There was little research on how to improve ease of use to promote technology adoption and create inclusive e-services. This

research highlights the main issues that affect ease of use drawing a bigger picture of the requirements that facilitates easy and inclusive ICT. Even though the study was conducted in a Local Council, the results of the study can be extended to other contexts. Especially since these issues are still present in the vast majority of e-services. This research also contributes to the extension of task-technology fit to digital divide research to cover design issues that can affect the people's access to technology. Provided that technology has proven its importance to people and that people are no longer hesitant of its worth, this research moves the digital divide research into investigating the fit between the users' capabilities and the technology.

Suggesting new ways to bridge the digital divide through improving the design of technology to address skills access instead of just looking at the financial and psychological barriers that hinders people from using ICT in their daily lives. By reducing the cognitive load of the digital interaction and focusing on usability as the main priority instead of aesthetics, the organisation can enable more people who have the will to use ICT but do not possess the ability to fully use ICT (Keates et al., 2000). Furthermore, this research contributes to the inclusive design methodology by proposing the Inclusivity Metric, which enables the designers to evaluate their ICT design in terms of ease of use. This Metric enables designers and users alike to rate the certain aspects on the interface, this gives a structured mechanism of evaluating the design in terms of specific areas in order to improve ease of use. This also allows the designers to assess whether their designs have met the criteria of inclusive design, therefore enable them to improve it on the following design cycle. This metric is also useful for user testing as it allows users to easily evaluate the design just through assigning numeric values to each criterion. This can be considered an addition to the field of

Inclusive Design in HCI, and continue on the work done by Keates et al. (2000).

### 8.2.2 Practical Contributions

In terms of practical contributions, the Inclusivity Metric proposed in the research can aid organisations to evaluate their websites but more importantly publish their rating to demonstrate the organisation's commitment to its customers. By showing that they promote equal access to all their customers young or old, able-bodied or disabled. Moreover, a nationwide implementation of the Inclusivity Metric allows customers to select the organisations that are mindful of their capabilities. As mentioned before, providing an easy and inclusive services is very important amidst the changes in demographics. Therefore, ICT needs to be responsive to these changes in order to satisfy the needs of the users and ultimately provide a better quality of life.

Contrary to some research that suggest that the digital divide is a temporary problem, this research reveals that the digital divide indeed is a long-term issue (Büchi et al., 2015; Vicente and López, 2011). Since the current pace of technology, advancement is overwhelmingly fast and older adults are observing how technology can improve their quality of life. The issue of technology-task fit is becoming increasingly relevant. All of this confirm the long-term contribution and viability of this research.

This research also contributes to feasibility of the inclusive design lifecycle as design methodology to demonstrate that the software design can also follow the principles of inclusive design. Previous research only applied the concepts of inclusive design on product design, studying how to design ergonomically to allow people to use products comfortably with minimum effort (Chan et al., 2009).

This research extends the principles of inclusive design to interface design. Working in a similar way where inclusive design helps to reduce the physical load for people when using tangible products. The Inclusive Design Metric enables designers to be mindful of the interface elements that can increase the cognitive load bearing in mind that the capabilities of the potential users.

Furthermore, the Inclusivity Metric introduced in this research gives designers an opportunity to see the elements that makes the interface easier to use by all potential users. It provides a more thorough method than design guidelines to evaluate the design, and see how it is able to satisfy the needs of the users.

## 8.3 Research Transferability

In quantitative research, the main purpose of research is study the relationship between certain constructs in order to predict future actions. Therefore, there is a great emphasis on the generalisability of the results to see whether they can perform in similar fashion in different context. In qualitative research however, generalisability is not the main outcome of any study. This is due to the different focus of each type of research, as in qualitative research deeper understanding of certain issue is achieved through interpreting the meanings of the phenomenon at hand. Given the research contributions discussed earlier, some aspects of the findings of this research can be used to enhance knowledge about usability and inclusive design. Given the size of the research participants, the findings cannot be generalised but some aspects of the findings can be used to understand certain sides of the inclusive design and the digital divide. Future studies can take the parts that they perceive fit to their research context and expand on them. Especially since there are a lot research that study usability in different context (Catenazzi

et al., 2012; Chandrashekar et al., 2006; Norman, 2005), the Inclusivity Metric proposed in this research can be used in different settings whether in health care or education. Furthermore, the weight allocated to each construct can be adjusted depending on the context of the e-service.

## 8.4 Limitations and Future Work

Even with the research, contributions mentioned above, there few limitations to this research that can lead the path to future research. The first limitation was the time constraints of the PhD program, which limited the researcher's ability to stay longer in the field to investigate further issues. Especially since the research was covering a project that has not been fully implemented yet. It would be interesting to have a longitudinal study to how these issues with usability will change overtime. Moreover, due to time constraints as well as bureaucratic processes in the Council, the researcher was not able to perform the usability test on the e-service created by the Local Council. More time would allow the researcher to perform more Action Research cycles to further advance knowledge and practice. This would have given more information about the e-service's inclusivity. Allowing actual users who are not involved in the project to fully evaluate the design. Instead, the Insurance Company's e-service was used to show how different e-services tackle ease of use in the interaction.

Moreover, the research studied web applications on a desktop platform. Given the nature of the technology developments and the rise of mobile computing (i.e. smartphones and tablets) it would be more interesting to test the inclusivity metric on the touch-based platforms as they differ in the interaction mode from the e-service delivered in desktop environment. Given that in the context of

desktop-based e-services, the customers have to have a command in using a keyboard and a mouse to interact with the elements of the interface. This need for these peripherals is not required, as the customer only need their fingers or a pointing device. This adds new dimension to Inclusive Design principles, as the finger dexterity is more important in the touch-based platforms. Moreover, with the Inclusivity Metric itself the weight of all constructs is distributed equally it would be interesting for future research to conduct the study in different context where the constructs have different weights. For example, using the Inclusivity Metric in a context where readability has more importance than the other constructs.

Furthermore, this research has been conducted in a local council were they had automate a process that they are obligated to offer to their customers. It would worthwhile to investigate the issue if the research was conducted in business context instead of a government context. There is more freedom for organisations to experiment with design, thus allowing them to come up with more innovative solutions. Moreover, the competition between businesses can allow the design team to push the envelope and fully implement an inclusive solution instead of sticking to legacy design lifecycles. Especially since Inclusive Design would also give the organisation a competitive edge over its competitors, contrary to the government context in which customers do not have alternatives, so they are restricted to what the government offers. Therefore, a study of inclusive design is the business context would provide a richer picture in which the organisation is not bound by its legacy systems, as well as they will be more willing to take risks to satisfy customers' needs. Especially since the customers have, more freedom to choose the organisation that offers the easiest interaction experience that, allow them to conduct their transaction without the need for others.

## 8.5 Summary

This chapter highlighted the contributions of the research, demonstrated how this research advanced knowledge in terms of theoretical, and practical contribution. In terms of theoretical contribution, this research demonstrated the main factors that promote ease of use in technology, a construct that is used in many technology acceptance theories. The research developed deeper understanding of how these factors affect the interaction with technology, which can ultimately affect their technology adoption decisions. Moreover, this research expanded knowledge about skills access, which is a type of access inequality that can widen the digital divide.

In terms of practical contributions, this research introduced the Inclusivity Metric that can aid designers to evaluate their designs. This metric can also be used in usability testing of the e-service with users, as it only requires them to answer questions about their experience while using the e-service to ultimately give the Inclusivity Score that shows how easy to use and inclusive the e-service was. Moreover, this research expanded the inclusive design principles into interface design.

Then, this chapter highlighted the limitations and future work that can be suggested from this research. The inability to test the e-service designed by the Local Council was one of the limitations, it would have been beneficial to conduct usability tests on the e-service designed by the Council with actual users instead of the design team who are already involved in the project. Moreover, the research was conducted in a small local council. It was suggested for future research to conduct similar studies in the business sector to extend the findings into other fields.

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# Appendix 1: Usability Testing Consent

## Experiment Purpose & Procedure

The purpose of this experiment is to evaluate websites in order to examine their suitability for users from different age groups.

The experiment consists of two parts as follows, during which you will be asked to use a website to request an insurance quote by entering sample information given by the researcher.

After the experiment, you will be asked to complete a questionnaire, and discuss the interaction with the researcher in a group interview.

Please note that none of the tasks is a test of your personal intelligence or ability. The objective is to test the user friendliness of the website using our assessment scale.

## Confidentiality

All data will be coded so that your anonymity will be protected in any research papers and presentations that result from this work.

## Finding out about result

If interested, you can find out the result of the study by contacting the researcher Faisal Hammad, after 30/9/2016. He can be contacted in room D07 YANG Fujia, Jubilee Campus, University of Nottingham. His phone number is 0115 843 1398 and his email address is lixfih@nottingham.ac.uk.

## Record of Consent

Your signature below indicates that you have understood the information about this experiment and consent to your participation. The participation is voluntary and you may refuse to answer certain questions on the questionnaire and withdraw from the study at any

time with no penalty. This does not waive your legal rights. You should have received a copy of the consent form for your own record. If you have further questions related to this research, please contact the researcher.

## Appendix 2: Inclusivity Metric

| Construct | Description | Score | | | | |
|---|---|---|---|---|---|---|
| Readability | The interface uses simple language with no jargon | 1 | 2 | 3 | 4 | 5 |
| | The fonts used are clear | 1 | 2 | 3 | 4 | 5 |
| | The interfaces does not have acronyms | 1 | 2 | 3 | 4 | 5 |
| | The interface uses active voice | 1 | 2 | 3 | 4 | 5 |
| | Flesch-Kincaid Reading Ease | | | | | |
| Sub Score | | | | | | |
| Affordance | The interface provides visual clues for navigation | 1 | 2 | 3 | 4 | 5 |
| | The interface | 1 | 2 | 3 | 4 | 5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | provides audio clues | | | | | |
| | The interface avoids drop down lists | 1 | 2 | 3 | 4 | 5 |
| | The interface provides logical mean to know how to use the elements in it. Like using illustrative icons | 1 | 2 | 3 | 4 | 5 |
| Sub Score | | | | | | |
| Error Tolerance | The interface does not allow entering invalid data | 1 | 2 | 3 | 4 | 5 |
| | The interface tells you the correct format for each field before entering | 1 | 2 | 3 | 4 | 5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | The interface validates the data as soon as it is entered | 1 | 2 | 3 | 4 | 5 |
| | The interface avoids text fields unless necessary | 1 | 2 | 3 | 4 | 5 |
| Sub Score | | | | | | |
| Organisation & Colour Coordination | The data are clearly divided | 1 | 2 | 3 | 4 | 5 |
| | The data are logically divided | 1 | 2 | 3 | 4 | 5 |
| | The interface uses a good contrast between text and background | 1 | 2 | 3 | 4 | 5 |
| | The interface does not only rely on colours | 1 | 2 | 3 | 4 | 5 |
| Sub Score | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Natural Information Flow | The interface provides a logical information flow | 1 | 2 | 3 | 4 | 5 |
| | The interface informs the user of what is needed to finish a transaction | 1 | 2 | 3 | 4 | 5 |
| | The interface provides navigation steps to show the position in the process | 1 | 2 | 3 | 4 | 5 |
| Sub Score | | | | | | |
| Vigilance to Users' Abilities | The interface provides large selection options (e.g. radio buttons, check boxes, buttons) | 1 | 2 | 3 | 4 | 5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | The interface provides a black & white option | 1 | 2 | 3 | 4 | 5 |
| | The interface provides options for bigger or smaller text | 1 | 2 | 3 | 4 | 5 |
| | | | | | | |
| Sub Score | | | | | | |
| | | | | | | |

## Appendix 3: W3C Accessibility Priority 1 Checklist

The checklist is taken from W3C Accessibility checklist available at: https://www.w3.org/TR/1999/WAI-WEBCONTENT-19990505/full-checklist.html

| **In General, (Priority 1)** | **Yes** | **No** | **N/A** |
|---|---|---|---|
| Provide a text equivalent for every non-text element (e.g., via "alt", "longdesc", or in element content). *This includes*: images, graphical representations of text (including symbols), image map regions, animations (e.g., animated GIFs), applets and programmatic objects, ascii art, frames, scripts, images used as list bullets, spacers, | | | |

| | | | |
|---|---|---|---|
| graphical buttons, sounds (played with or without user interaction), stand-alone audio files, audio tracks of video, and video. | | | |
| Ensure that all information conveyed with colour is also available without colour, for example from context or mark-up. | | | |
| Clearly identify changes in the natural language of a document's text and any text equivalents (e.g., captions). | | | |
| Organise documents so they may be read without style sheets. For example, when an HTML document is rendered without associated style sheets, it must still be possible to read the document. | | | |
| Ensure that equivalents for dynamic content are updated when the dynamic content changes. | | | |
| Until user agents allow users to control flickering, avoid causing the screen to flicker. | | | |
| Use the clearest and simplest language appropriate for a site's content. | | | |
| **And if you use images and image maps (Priority 1)** | **Yes** | **No** | **N/A** |
| Provide redundant text links for each active region of a server-side image map. | | | |
| Provide client-side image maps instead of server-side image maps except where the regions cannot be defined with an available geometric shape. | | | |
| **And if you use tables (Priority 1)** | **Yes** | **No** | **N/A** |

| | | | |
|---|---|---|---|
| For data tables, identify row and column headers. | | | |
| For data tables that have two or more logical levels of row or column headers, use mark-up to associate data cells and header cells. | | | |
| **And if you use frames (Priority 1)** | **Yes** | **No** | **N/A** |
| Title each frame to facilitate frame identification and navigation. | | | |
| **And if you use applets and scripts (Priority 1)** | **Yes** | **No** | **N/A** |
| Ensure that pages are usable when scripts, applets, or other programmatic objects are turned off or not supported. If this is not possible, provide equivalent information on an alternative accessible page. | | | |
| **And if you use multimedia (Priority 1)** | **Yes** | **No** | **N/A** |
| Until user agents can automatically read aloud the text equivalent of a visual track, provide an auditory description of the important information of the visual track of a multimedia presentation. | | | |
| For any time-based multimedia presentation (e.g., a movie or animation), synchronise equivalent alternatives (e.g., captions or auditory descriptions of the visual track) with the presentation. | | | |
| **And if all else fails (Priority 1)** | **Yes** | **No** | **N/A** |
| If, after best efforts, you cannot create an accessible page, provide a link to an alternative page that uses W3C | | | |

| | | | |
|---|---|---|---|
| technologies, is accessible, has equivalent information (or functionality), and is updated as often as the inaccessible (original) page. | | | |