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Abstract (for dissemination)	<p>This report presents the findings from an investigation of retired users of digital technology living within the UK. The majority of the participants had not used digital technologies extensively during their working lives; and many were in awe and excited by the internet. User skills were mixed, showing that confidence in using digital technologies was influenced by infrastructures such as the availability of affordable and robust broadband and service support for using the digital technologies. It is unsurprising that the findings mirrored previous research which suggests that the majority of retirees who access digital technologies on a daily basis tend to have increased wealth, educational levels and live within urban areas compared with most non-users of digital technologies. As such underlying structural issues can act as important motivators for sustained use of digital technologies in later life.</p> <p>This report outlines the specific requirements for supporting this group of users when using a proposed online collaborative site.</p>



**Elders Up!: Adaptive system for enabling the elderly collaborative
knowledge transference to small companies**

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1 Introduction

1.1 Definition of digital technology

We define digital technologies, for the purpose of this research, as any electronic device with the capability to connect to the internet and which can be used as a communication and information seeking device. Consideration was also given to any adaptive or plug-in technology which supported the use of the technological devices, such as standalone speakers and printers. Assistive living devices such as pressure sensor mats to detect movement patterns, were not considered in the research. The majority of devices were readily available in most major retailers and were not specifically designed for older people to use.

This report examines the motivations which older people (aged 60 years and above), living in the UK, utilise to engage in the use of digital technologies. These psycho-social motivations are varied but can be considered as;

- Those related to lifestyle opportunities such as the financial need to continue working
- Personal views related to post-retirement motivations for engaging in work related activities
- Health conditions which may impact upon working and using digital technologies
- Motivations for using digital technologies in general
- Motivations for using digital technologies in relation to obtaining post-retirement employment
- Local infra-structures such as broadband connections, technology groups

We defined digital technologies, for the purpose of this research, as any electronic device with capability to connect to the internet and used as a communication and information seeking device. Consideration was also given to any adaptive or plug-in technology which supported the use of the technological devices, such as standalone speakers and printers. Assistive living devices such as pressure sensor mats to detect a movement patterns, were not included in the research. The majority of devices were readily available in most major retailers and were not specifically designed for older people to use.

Using the supporting literature and the findings from the research with several groups of participants, this report will suggest that the motivations for using digital technologies in a sustained manner are complex. There is frequently interplay within and between the above types of motivations. These interplaying factors were not fixed and

represented many subtle factors which determined the decision making about engaging in and using digital technologies.

The report assumes that the older users were capable of taking both opportunities and decisions about how they wished to use and engage in digital technologies. As such, they were not passive recipients of technology but actively sought to adapt and make the digital technologies work for them in often highly creative ways. This perspective may be key to ensuring that the future designs and delivery of technology based knowledge is such that older people can be co-creators and able to manipulate and customise the digital technologies to maximize their usage. Some even devised and made hardware and software by using “kits” such as Raspberry Pi and Arduino. This was aided by the community educating itself through knowledge exchanges, YouTube instruction videos and paper based materials. Paper based manuals such as computer magazines and notepads were frequently used concurrently with digital technologies.

The report starts with an overview of the changing retirement terrain in the UK and suggests the ways in which potential post-retirement age workers may be identified as beneficiaries of using an online collaborative network. From this, factors such as psychosocial motivations for seeking and gaining post-retirement work are discussed in the context of normal ageing processes and also limiting chronic conditions. Whilst decline is not an inevitable aspect of ageing, the report summarises specific aspects such as visual decline, which may impact upon the effective use of digital technologies. The report then focuses on the ways in which the participants in the research used and adapted digital technologies to match their motivations. These motivations were found to be complex but easily determined by close examination. Knowledge about the predominant motivations amongst older people who may engage in post-retirement work can provide important information about how configurations of work can support older people in the employment arena.

1.2 Retirement Concepts

Retirement has traditionally been considered as a period towards the latter stages of the life course of disengagement and decline. This outdated perspective has been superseded by a concept of retirement which is varied and highly individualised. Notably most retirement trajectories include some seeking of opportunities to remain engaged in income generation with greater purpose and social impact (Freeman, 2007). Typically, retirees were found to have little desire to continue working at the same intensity or type of work and so actively sought disengagement from the old to the new. The social aspects

of post-retirement, including group meetings and working as a team, were highly sought and thought to increase work commitment and productivity. Many retirees wanted to work into their late 80s' a viewpoint which challenges the notions of contraction of activity through the last years of life. A significant proportion of retirees consider retirement to be a period of learning new skills, pursuing old hobbies and sharing of experience and expertise across the generations.

Recent evidence from retired managerial and professional retirees suggest that many have little desire to continue in the same type of work and actively seek out opportunities which include some form of skill sharing and meaningfulness. These jobs tend to be within the spheres of charitable or meaningful contribution (Sargent et al, 2011). However, there has been to date, fewer enquiries which sought to identify retirees who for often physical and/or emotional stress factors choose to change direction in their work choices and so sought work which could accommodate these needs.

1.3 The nature of retiree work

Research suggests that the nature of work typically changes within the first few years of retirement (Sargent et.al 2011). The motivations for change are attributed to alignment with personal values and a desire for flexibility rather than constraints associated with chronic health or financial concerns. Rather than seek traditional status associated with highly pressured relentless work patterns, the retirees sought work which included a sense of choice and flexibility in hours and working patterns. Income stability was a strong motivator but seen as providing a financial safety net and not the key source of necessary income.

Caution needs to be taken with these findings though, which typically were based on data collected before the economic crash in Europe and sought to include managerial and professional retirees. As such the demand for flexible work may be one of financial necessity amongst a growing proportion of retirees who may no longer be confident about their pension security. Cultural and financial pressures to maintain the same levels of disposable income may be a key factor in future working patterns. However, it is likely that retirees wishing to continue in work seek to do so on their own terms regardless of the type of work.

The motivations to continuing to work may can be related to the belief that regular work prevents physical and cognitive decline; *use it or lose it*. Neuropsychology suggests that there may be some truth in this notion and that maintaining a healthy body and mind

can slow down the progression of decline related to growing old. Findings from this research identified that some participants expressed a fear of developing dementia related conditions and considered that working and engaging in activities would help to stave off the possibility of cognitive decline. Other participants expressed the need to avoid “sticking with my age group” and stressed the belief that work provided a social opportunity to mix with all ages.

In searching for meaningful work the personal motivations can be identified amongst retirees as;

- desire to be productive and contributing positively
- useful to society, often within local communities
- maintain a work identity
- engage in new activities
- legacy building by sharing key skills and expertise
- maintain a recognised professional identity

These perspectives could be utilised to identify prospective flexible research based employment amongst retiree applicants.

1.4 When do retirees seek work?

In the immediate period of retirement, recent literature suggests that this is often experienced as a period of profound losses. These losses can be structural in terms of loss of high income, routines and weekly patterns. Related to these life style changes can be a losses related to psychosocial factors in terms of identity, realisation of disposability, mortality and assumed decline. The first 2 years of retirement are frequently experienced as one of fluctuating loss and adaptation to change with a focus on leisure and immediate relationships (Nolan and Scott, 2009). Emerging from this period, many retirees seek work as meeting the needs expressed above and an acceptance of adaptation to changing lifestyles and motivations.

And then when I finished work I thought that's it, computers and everything, I don't want to know (laughs). And then of course things took off and you think well you needed so and so and we got one at home. And it's like a lot of my colleagues as well, when you retire you don't want anything to do with it, are you with me? Bert, retired aged 66years then recommenced work at 70years

This means that, perhaps contrary to societal opinion, retirees may not be seeking employment within the immediate period of commencing retirement. Rudman (2006) considers this immediate period post-retirement as a societal response to seeking of consumerism to support a leisured lifestyle. Alternatively, some retirees may choose to be seen as “non-retirees” and launch themselves into patterns of contribution and learning, such as charitable work. Fast and de Jong Gierveld, (2011) described this as a societal pressure and discussed the notion of “*compulsory volunteering*” as a necessary action to support assimilation into local groups of retirees. Caution needs to be taken with these concepts of retirement as they are likely to be extremes on a continuum of expectation and experiences but do give an interesting overview of the complexities of motivations.

Attitudes towards retirement and the experience of retiring can provide insights about the likelihood of an individual to consider paid flexible employment during their retirement. Sargent et.al (2011) proposes that there may be very practical implications to identifying future return to workers *within the first year or two of retirement* as a future resource for smaller businesses and charitable organisations. This is because smaller organisations may manage to offer more flexible agreements which meet the desire of the retiree to participate on their own terms and meanings. As Sargent states:

“Our findings indicate that a proportion of retirees, those following the contributing on your own terms and searching for meaning configurations, may want a suite of options, including returning for research-based work, working part-time and finding ways to marry voluntary and corporate responsibility activities...” (Sargent et.al page 323, 2011).

Collaborations with small local organisations may be very productive and satisfying for both the employer and older employee. Retirees may show preferences for sharing their expertise by seeking to use only the most satisfying parts of their skill set, which is likely to be their most skilled. This has to be advantageous for the employer who gains a highly motivated flexible contributor in the workforce.

1.5 What sort of work do older people wish to do?

This research identified a diverse range of skills. Amongst those remaining in work, the skills used tended to relate to administration and customer services, especially within small family businesses. More rural businesses tended to provide work in the form of hospitality and specialist products. We identified one older person who continued to produce artisan cheese although she regretted that digital technologies were not robust enough to distribute the product beyond the local community. The key motivations for

those engaged in family businesses was one of legacy and also seeking to maintain some expert authority within the family. Amongst such workers there was a fear of not coping with retirement and the concept of this was often dismissed as not relevant to them. As such then, this group simply continued to maintain and adapt their working without any disruption to their working lives as they grew older.

The second group of post-retiree workers were engaged in charitable work and very active in using previous skills such as accountancy to support their local groups. As such this group expressed the paradoxical situation of often isolatory home working and contraction of social contacts. This group of workers were not seeking financial gain and were often financially content.

A third group of retirees indicated no interest in using pre-retirement skills and perceived post-retirement as a period to focus on new hobbies or activities which could also potentially raise income. This group, whilst motivated to work, sought meaningful work on their own terms and sought work which predominantly kept them in contact with people but was not considered “taxing on the grey stuff”. Within this group our findings identified a road crossing helper (lollipop man), a volunteer in a school and a plant grower/ wreath maker. All of these participants had previously held managerial or specialist technology jobs pre-retirement. It would appear then that some older people, whilst motivated to engage in post-retirement work deliberately seek out work unrelated to their previous jobs for reasons which include a desire to maintain contact with others and to contribute positively to society.

1.6 What sort of occupations did people do pre-retirement?

A wide range of occupations were identified in this research, with the male participants having worked in the main professional groups as would be expected in this age group. Professional occupations included aerospace engineering, pharmaceutical researcher, chemistry university lecturer, midwife, social worker, accountant, lawyer, politician, NHS manager, union representative, Head teacher and a structural engineer. Other skilled occupations included stonemasonry, farmer, cheesemaker, secretary, administrator, dressmaker, bus driver, butcher, farrier and dry stone waller. Married women tended to outline a series of voluntary roles throughout their lives as predominantly homemakers.

2 Ageing

Current research and knowledge about human ageing suggests that whilst there may be many biological and psychosocial changes these are not universal and the impact of these vary between individual older people.

Previous research into ageing tended to recruit older people who were frequently living in nursing homes and as such often experienced multiple cognitive and physical health challenges. This work contributed towards societal perspectives of ageing as an inevitable period of inexorable progressive decline and dependency. This is now considered incorrect as work focusing on healthy ageing indicates that whilst there may be changes in cognitive abilities these in themselves do not mitigate against an active and independent future. The message now is that many people do recognise changes but use their capacities to adapt and devise often creative ways to circumvent these limitations. Daily physical and mental exercise in the form of aerobic exercise (Hawkins, 1996) and lifelong learning (Gilsky, 2007) can limit the pace and extent of decline in old age and may even reverse changes in cognitive processing by building new neural pathways (Harwood, 2011).

2.1 Cognitive Ageing

Cognitive changes do occur in the ageing brain which shows no sign of any disease process. These changes can be categorised as memory, attention and decision-making which are all relevant to users of digital technologies. Evidence suggests that some of these are more affected than others within the same spheres (Glisky, 2007). Perception can also show significant decline but this is thought to be directly related to sensory changes. Compensatory mechanisms are thought to develop across these domains, often evidenced by increased ability in some areas of cognition and attention as ageing occurs. These compensatory mechanisms challenge the perception of ageing as one of cognitive decline. There are other more subtle changes but these are not detailed below as they are not directly relevant to technology use in older people.

Memory changes fall into two main groups involving the verbatim memory processes and processing tasks. Evidence suggests that whilst verbatim memory may decline, there is improved sequencing or gist memory. Sequencing (Gist) memory includes the ability to process tasks such as the categorisation and assembly of information. Older people are able to learn new skills and reproduce them over time. This is probably why

many older people like to engage in fairly advanced technology skills such as building software as it demands highly structured sequential tasks and information assembly. Notable types of work which may be characteristic of these cognitive skills include accountancy, bookkeeping, rota scheduling, archiving and genealogy.

..” And another thing is that various sites will give you a video of what you’re doing, even to taking things apart or building things or if you’ve got something ... you know, go onto our site and we’ll show you how to do this. I find those very good you know, you can say well this fits here, that fits there. They’re good and not every site does it you know”. Bert, aged 65 years.

By contrast, the decline of verbatim memory may impact upon remembering names, places and more recent events accurately. This may have implications for the ability to remember login details and navigating complex websites. However, many people do devise personal ways of remembering by using simple reminders such as plant species for passwords and keeping written logs of all passwords and websites of interest. Clear directional prompts, with cues to indicate the next expected action would support users.

“Whatever I’m going into I try to have something that associates with that. So Royal Mint might have RM in it but all different combinations. And we use different combinations of the grandkids and their age. So it’s initial so and so and so and so for anything to do with a certain thing”. Sam, aged 70 years plus on passwords

It is important to recognise that many older people have devised highly effective ways of managing their loss of prospective memory, often by use of paper lists and notes which act as cues during the learning of tasks. As such reminders and alerts could be incorporated in any interface to support users during the early stages of engagement. It may also be necessary to provide log-in prompts or to consider other ways of accessing sites which may not require a log-in process.

“...we wrote it all down when we were there and that’s on a card but in the box. So those sorts of things but yeah, I don’t have a problem with the passwords at all. They can get a bit close you know and then I like sites that tell you that your password is extra secure or not secure. I’ve got one site that tells me my password is in the middle of the road and I thought well leave it in the middle of the road”. Sam, aged 74 years

Attention is often assumed to be lowered in old age but recent work, especially with older people using digital technologies indicates that compared to younger users, they

show marked longer attention spans, persistence and are methodical in their actions. The potential downside to this is that these actions may take longer but are likely to be most accurate in their outcome. The difficulty arises when the digital technologies cannot be set to allow for the time taken to consider and execute a task. Older people may show marked difficulties managing to multi-task, for example having to switch between numerous concurrent tasks such as car driving. For businesses the accuracy of outcome and methodical approach may be highly sought regardless of the time taken.

"I managed to work out how to update my computer with a few new parts and taking bits from a couple of old printers...well I made a profit on the printer as I sold it on ebay...then I could get a new drive and soundcard for the main....it was good to do and I once I get going time flies..." Sam, aged 74years.

Decision-making is often based on prior knowledge accumulation and experiences. This may be an advantage in that often difficulties can be independently circumvented or multiple approaches taken without lowered determination to succeed. This can be a distinctive advantage in the workplace and help to provide motivation to others to persist in finding solutions.

It is worth noting that older people tend to give most weight to the opinions of experts and that it is important that this is not abused as a bias. This is especially important within online forums. One participant explained how he had mistakenly taken the advice about solving a computer problem from a self-confessed expert, only to find out this was a hacker. Negative experiences such as this can lead to a reluctance to engage in digital technologies and a fear of people who engage in online forums. This perception of the negative aspects of technology usage were often cited with extreme worry and caution which needs to be addressed to enable older people to feel safe when using digital technologies.

"So after that [hacking] I was very cautious. I use Kaspersky as regards an anti-virus type one, alright it's not cheap but it's brilliant you know, straightaway it will block, so I'm quite happy with that. But banking we don't use". Sam, aged 74years

"...I'm internet resistant because too much staring at the screen wouldn't do me any good. I like to be in control and worry that someone is reading my work" Emily, writer, aged 73 years.

2.2 Communication

Communication may also be a consideration with older people. Colour perception tends to decline as the lens and receptors become denser and less able to rapidly discriminate between colours. Shades of blue tend to become less defined followed by greens as the normal ageing process. High contrast is important with bland backgrounds to provide contrast. From the age of 40 years, the lens of the eye begins to harden leading to lowered ability to read small close text and to adapt from close to distance sight. Larger print using more pronounced fonts support word discrimination and avoid frustrations when trying to read. Generally fonts sized 36 and above were used as standard size amongst the users observed during the research.

“Certain sites that I use quite regular I find them fairly dark” Emily, aged 73 years.

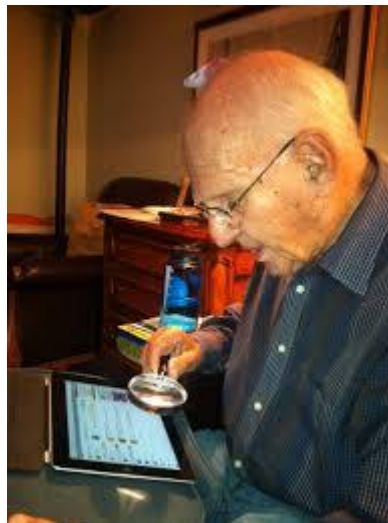


Photo of combined use of handheld magnifier with tablet technology.

Hearing loss may also be experienced by older people. There is an established resistance to using hearing aids and many older people rely upon other ways of managing to elicit information such as using written formats. However, when using digital technologies many people use standalone speakers or headsets to access information. For those with profound hearing limitations, the use of subtitled text may be essential to access information which provides primarily audio content.

“I do not want to lose my independence and so using this system would help maintain that.” Frank, aged 79 years.

2.3 Chronic Illness

Many older people do have chronic illnesses which may limit their energy levels and abilities to work long hours and/or physically challenging jobs. The presence of illness may demand flexible part-time working and a more open adaptive attitude towards the translation of established skill sets to other areas of work. However, this ability to adapt and continue working may be a positive contribution to the workplace and provide opportunities for empathetic collaborations with others in the workplace. Inter-generational work schemes which link young people with more senior staff in the role of a workplace buddy can help to build positive work and communication skills invaluable for future employment.

The main types of chronic illness difficulties related to physical limitations. These were mostly either communication such as hearing loss or fine-motor control limitations. Fine-motor control can make it difficult to use standard mice and pointing devices with tablet digital technologies. Several users in one group regularly used chunky pencils or pens as pointing devices. These “pointers” had the advantage of beveled sides enabling easier sustained grip than a smooth cylindrical shape.

Tremors in the hands and also head could make using digital technologies a more arduous task as many cursor controls operated at very responsive high sensitivity levels. The development of touch screens provided more control, by use of sweeping motions rather than finger tapping, without any of the stigma associated with using tracking or larger adaptive devices. This was important for users who carried their tablets and mobile phones into public places where they wanted to blend in with the majority users.

*“I am just like any of them [other users]; my brain and inside is young but my fingers just like to be awkward...but the things around me help like my pointer [pencil] and the comfy cushion[to prop tablet]. The problem is being in public can be tricky but I get by...”
Sam, aged 74 years.*



Mobile phones can be difficult to use.

Consistent findings from this research confirmed that older people found smart phones to be fiddly, frustrating and difficult to hold. As such many had abandoned them in favour of mobile phones which simply enabled calls and texts. Many had bought phones as an emergency device and rarely bothered with texts or even charging them up. This indicates the low esteem the users had for these devices even though they were acknowledged as potentially important in a crisis (Zhou, 2013). This is important for small businesses and employers to understand that SMS texts are more likely to be ignored and so important information should not be relayed using this mode of communication.

Specific aspects of chronic illness may require workplace adaptations in the form of more flexibility, extending deadlines and seeking to accommodate any specific technological adaptations. Generally the employment of people with disabilities and/or chronic illness is thought to be overall beneficial for employers and employees. In short, illness is not an indicator of inability to work or remain in work as those who want to work will seek to find supportive mechanism to enable work to continue.

3 Adaptive Digital Technologies for the Older Person

Research indicates that older people resist using any devices specifically marketed or designed for those who need some compensatory adaptations which can be readily identified as such (Peek, 2014). There was a clear association with using adaptive digital technologies which were obtrusive with the notion of confirming frailty and loss of control. As such most noticeable devices designed for the elderly were thought to stigmatise the user. Paradoxically, users who combined their own devices which were noticeable did not associate this with stigma but with creativity and evidence of intellectual ability.

This means that older people will seek out digital technologies which do support their needs but are marketed for a universal user. Notably, older people prefer the use of larger android tablets than mobile phones and will change the settings to manage their interactions. This is because large screen tablets are physically larger and so can be found easily in the home and are less likely to be sat upon, easier to hold, and weigh more - which is reassuring to many users who worry about dropping them. They were also considered mobile enough to pop into bags and use when away from home. Tough protective covers were purchased providing they did not look too cumbersome. Some participants had made their own distinctive covers as a way of finding their device easily and to personalize it.

This reluctance to purchase or use overt adaptive devices by older people is important to providers and users. Users want digital technologies to work interchangeably with each other in a smooth way and to provide cheap or free software to do so. Evidence from this enquiry demonstrated that many older people are creative in using other, often older, devices to connect up with more recent digital technologies. Tablets were used in a similar way to desk top computing in the home by using wooden blocks or books to prop them up and connecting to printers, speakers and mice for ease of use. It is unlikely that technology designers envisioned this adaptive usage of old with the new but it would seem to be characteristic of older users to “make do and mend” rather than spend and replace. This could result in compatibility issues between various devices and adaptations.



Photo of combined use of tablet and magazine to source information

Participants in the research held an expectation that their devices would only be replaced when they were worn out and so that there minimal impetus to replace with new models as they were released. This has implications for the ways in which tablets are marketed and as such manufacturers need to commit to providing upgrades for earlier models rather than assume that older users will happily purchase the latest version. This perception and belief in the longevity of tablets resulted in more interest in the android devices than the major producers on the basis of less is more. These perspectives demonstrate some of the concerns older people experience when wishing to use digital technologies in ways acceptable to them.

3.1 Standard information digital technologies

The majority of older people involved in this research preferred to rely upon recommendations from friends and family to assist in choosing their digital technologies. Cost was often a key factor in choosing technology (Wöhrmann, 2014). Adverts and direct marketing were largely ignored unless the source of information was considered impartial and expert, such as “Which” magazine recommendations. However, there was a marked tendency to source information from same age users rather than younger family members; three respondents mentioned how well-meaning relatives had gifted the latest phones and devices only for them to remain unused because of difficulties with using small keys and navigating the device. For some users this was a de-motivating experience and there was a reluctance to try any other digital technologies. Others did persist and utilised both same age user knowledge with specific computer magazines to make a considered choice.

"I've taught myself how to programme and download apps...even make sure nobody can identify my whereabouts or who I am. I share computer magazines and use those to help me. It passes the time. I enjoy the challenge..." Sam, aged 74 years.

Large (more than 10") tablets were considered a huge stride in accessing digital technologies in ways which obscured the limitations experienced by some users. This is significant and indicated not only the benefits of designing and providing "standard" digital technologies but also the importance of choice in buying and using digital technologies amongst this group of users. A large amount of consideration and energy was used in decision-making about which type of technology to use (Wöhrmann, 2014). Many older users embraced technology and considered it a marvellous way to connect and learn:

"This [tablet] is great; I wish it had been around earlier" Emily, aged 74yrs



Photo of group participant learning how to use tablet.

3.2 Learning to use devices

It cannot be assumed that older people will instinctively understand how to use new devices (Peek, 2014). This is because for many, even amongst those who had previously worked, computer based digital technologies in the workplace were the exception and certainly not provided for all workers. One participant explained that as a legal secretary, she arrived to find a desktop computer and screen on her desk adjacent to her electric

typewriter. No training was provided so she rapidly relocated the technology to the floor and continued with her typewriter until she retired. There may be an assumption that older people will try and discover how new devices work but there is often a fear of damaging or losing information. As such, users benefit most by joining computer clubs with sensitive expert help to provide reassurance and assistance.

Concerns about using digital technologies were numerous and included privacy and security of information fears, breaking the devices, excessive use of electricity for charging, harming eyesight, encouraging a violent personal attack, reducing social interactions with others by reliance on emails and taking up too much time.

"I never take mine out...well it might attract the wrong attention...might get attacked even in the centre of town". Molly, aged 72 years

The majority of users desired practical robust digital technologies which could manage with any potential errors made by the user. Interfaces need to be clear and provide necessary guidance of use in ways which are informative. Scrolling and navigation were found to be two aspects which caused general confusion, especially when sites were redesigned.

In summary older people were found to be enthusiastic to embrace the use of unobtrusive digital technologies providing they were affordable, easy to learn how to use effectively and demonstrated some practical benefit to their lives.

3.3 Using digital technologies to support post- retirement work motivations

The participants were asked about the potential benefits of using digital technologies to support their desire to work or continue working into their older years. Most considered digital technologies to be of overall benefit and enjoyed the challenges of learning how to use and adapt their ways of working with the digital technologies. Identifying the particular perceived benefits of using digital technologies to support the networking and sustaining everyday work tasks such as bookkeeping, accounts and email communications were generally well considered with a multitude of positive views offered. Participants who had developed familiarity by regular use of various digital technologies were most motivated to continue to expand their knowledge and enjoyed the challenge of new applications and seeking of information.

Individuals who were actively considering working were concerned about the social aspects of using digital technologies. Most valued the idea of working in small social groups and emphasized the importance to them of being able to work with similar peers,

regardless of their ages, to support knowledge sharing and also to gain the psychosocial aspects of working.

“the thing is, at my age you have to know when to give meaningful advice and when to shut up...sometimes old people talk a load of rubbish and that’s because they have no one to talk to most of the time. Well, I mean, talk to properly. Old mixing with old is no good. Saying that, I wouldn’t want to be stuck in the corner of the office as the token silver surfer...that’s no good for me either”...Barbara, aged 72 years.

Some individuals in rural areas felt “held back” by the lack of robust technology infrastructures such as fast broadband and mobile reception. These users showed marked de-motivations for using digital technologies to secure work and tended to rely upon word of mouth and/or contact with local public and third sector organisations. Although beyond the remit of this research, the provision of reliable and robust digital infrastructures to support all business use in a community is of paramount importance for the growth of those businesses.

“There is little point in using this daily....how do local companies cope? I have days on end of nothing and BT aren’t interested...otherwise this is a great idea [collaborative space] for retired people to keep going” Margaret, aged 68.

“It’s a good idea but not for me. I have enough trouble with the internet connection so don’t bother much. But in the future more and more people will have to work into old age, even the carers...I don’t think there will be much choice about it...”Barbara, aged 72 years

“we’ve had a problem in town that ... actually getting a signal; so we haven’t had wifi, even now we can’t get fast broadband because County Offices have had all the scaffolding up, the box that we should have had never got built. So all this bit round here are still on the old steam radio”. Bert, aged 70 plus

4 Designing Interfaces for Older People

As previously outlined normal ageing can lead to several changes in cognition and physical function which can impact upon the ease of using technologies. This section will link these age-related changes with the implications of designing interfaces for older users. Following on from describing the possible implications, recommendations for designers to use will be suggested.

It must be remembered that all older people are unique and not all will experience all the age-related changes. Some older people will develop diseases which may lead to significant decline in ability to use technologies and others may barely find any changes at all. Above all else designers need to build flexible adaptable systems and interfaces which can accommodate a wide range of user from novice to expert and from mostly healthy to having significant age-related limitations.

4.1 Vision

Ageing Consideration	Implications	Recommendations
Peripheral vision reduces	Visual width reduced Focusing point more centralised and intense in centre	Minimal use of animation/pictures/flashing graphics Avoid scrolling/moving text Simple interface pattern
Letter discrimination declines	Difficulty reading long sentences and may obscure meaning	Sans-serif font, size 12-14 point, left justified text Text size change options
Colour discrimination declines with loss of blue/green vision initially	Poor contrast discrimination can confuse and frustrate user leading to poor understanding of interface	Bland background colour such as beige High Contrast such as black print Avoid blue/green adjacent to each other

4.2 Hearing

Ageing Changes	Implications	Recommendations
Higher pitched sound discrimination diminishes with age	Higher pitched sounds may not be heard	Lower pitched (male) voice-overs more acceptable due to lower frequency
Background noise can lead to confusion and distraction	Background noise increases cognitive load and increased sound discrimination	Avoid background noise Support using relevant graphics
Poor hearing across all frequencies	Poor sound discrimination can be uncomfortable and frustrating for user	Provide option to increase volume and/or sub-titles
Significant hearing loss and use of hearing aid	Disruption to hearing aid by locality with other devices	Provide compatibility option for plug-in speakers or other devices to help use aids with device.

4.3 Attention

Ageing Changes	Implications	Recommendations
Easily distracted from main task	Distraction can lead to disruptions in ease of use and create confusion	Avoid multi-tasking actions Simplify to promote more intuitive use Reduce irrelevant information; limit use of multi-media Clear signposting for navigating page and site Devise short time tasks with inherent short regular saving mechanism Provide customised pop-up prompts as optional to remind user of task

4.4 Memory

Ageing Changes	Implications	Recommendations
Memory efficiency related to task sequencing	Poorer memory for non-verbal items Familiarity important for repeat usage Difficulty retrieving names and passwords	No more than 5 items on display per page each time Maintain same core design regardless of updates Suggest ways of remembering information Provide reminders for logging in details and simplify process Suggest writing details as paper-based reminder
Short term memory less efficient than long term memory	Learning may be difficult until transferred to long term memory	Provide prompts to help learning in conjunction with above Clear commands Familiarity of interface important for repeat usage

4.5 Fine Motor Control

Ageing Changes	Implications	Recommendations
Fine-motor movements may limit finger control	Difficulty using finger pointing, computer mouse and keyboard Painful wrists if excessive movement required	Promote touch screen devices with sweeping action rather than small area pointing Avoid necessity for double clicking/tapping on buttons Enlarge area for pointing to 16.5-19.05mm with 6.25mm spacing between buttons (Zhao, 2007) Speech recognition software compatibility
Speed of movement may be reduced	Slower responses when using interface Increased stress on joints and muscles Increased cognitive load to manage actions and information assimilation	Extend time outs to accommodate slower response times Provide customized timing options Avoid multiple movement tasks such as scrolling, right and left mouse clicks, complex key inputs such as capital letters, numbers and symbols

4.6 Digital technology and other resource use

Ageing Changes	Implications	Recommendations
Older people prefer to use paper based materials in conjunction with technology devices	Acknowledge distinctive ways of accessing information by concurrent use of different media, especially during learning of new software	Provide paper based instruction manuals consisting of; <ul style="list-style-type: none"> • Larger print options • Screen shots of each interface page • Room for note-taking
Large touch screen usage highest in this group of users	Touch screen use reduces cognitive load, provides instant result Lowered spatial/visual coordination	Design for larger touch screen androids One touch gestures Symbolic gestures such as character, number, arrows Target size no less than 16.5x16.5mm (Stöbel, 2010) Between each touch sequence no more than 33mm. Response time 1400ms normal for older people (Zhao, 2013)

5 General Design Guidelines

The following include general recommendations for designing interfaces for older people to use. They are based on the premises of;

- Most people can only manage 7 items on a page at any time. For older people this reduces to about 5 items
- Older people do make mistakes and can find error messages distracting and anxiety provoking
- People are individuals with varying needs and abilities when using technologies
- Some older people do worry about their privacy and security of information when using the internet
- Older people may benefit from multiple formats such as larger text, prompts to continue, speech recognition software

Generally, design needs to;

- be consistent
- be robust
- be easy to navigate and to remedy mistakes
- have clear structured tasks from start to finish
- have consistent information
- be responsive to every action in a confirmatory manner
- have slower interfaces to support delayed reactions
- maximise attention by simple design

Summary

The following can be used to underpin all aspects of the design process;

- Keep it simple
- Keep it adaptable to individual user abilities with options to customise
- Avoid complex instructions
- Clear structure of tasks;
 - Key function unity (one key-one function)
 - Page function unity (one page-one task)
 - Incorporate wizard for complex tasks
 - Provide positive confirmations as much as possible.

6 Conclusions

This report examined the motivations which older people consider important in their decision-making about using digital technologies and post-retirement work. These decisions were influenced by their perceptions of working post-retirement, mental and physical changes and structural issues such as financial and social needs. Those participant who were eager to embrace the idea of working post-retirement were keen to do so on their own terms. Whilst their motivations were varied and individualistic the majority were very active and challenged the notion of older people as passive recipients in seeking out new challenges and learning. Most were receptive to using digital technologies so long as they met their needs and there were clear benefits. The ageing process does impact upon cognitive functions in ways which can be accommodated in the design and use of digital technologies. In themselves, these can no longer be considered as barriers to learning how to use digital technologies and to gain familiarity with various aspects of use. Robust, portable and affordable tablets were considered highly useful amongst the participants.

Post-retiree work was considered by the participants as a way of engaging in social life and providing stimulating challenges to keep the brain active. There were a significant number of highly motivated individuals, not all professionals, who were keen to continue, or to re-engage in working. The type of work sought did not necessarily reflect their pre-retirement work. The motivations for working were varied and evidence suggests that decisions to work or not work are changeable once retirement is experienced. Chronic health concerns did not necessarily negate a desire to continue to work but flexible part-time work was preferred.

With regard to using digital technologies as part of work, including the seeking of work these were generally seen as positive by the same group who were motivated to work post-retirement. These motivations were both personal and structural and included the challenge of using new digital technologies to enable the following:

- Providing new ways of working by accessing potential work sources without the need for formal applications and interview processes
- Provide new experiences and support emotional well-being
- Providing social contact, especially long-distance with family and/or those with mobility problems
- Potential to support inter-generational transference of skills, such as “universal workplace skills” such as effective communication

- Providing cross-engagement by networking and sharing information
- Enabling access to new work structures and types of work which accommodated any physical or sensory limitations
- Provide flexibility to manage chronic fatigue and other fluctuations in health and lifestyle
- Provide new opportunities to work as a virtual community and so combine home-working with “office style” working

These findings suggest that older people are very astute at describing their needs and realistic about the contribution they can make by gaining employment. However, many older people do not currently choose to pursue post-retirement employment for both personal and lifestyle reasons. Those most motivated to pursue employment tend to do so for reasons which are connected to meaningful contribution, legacy building, trying new challenges and sharing knowledge. The group of people most interested in pursuing post-retirement employment were not only professionals but also those with “craftsman” skills such as stonemasons and cheese-makers. As such the scope of the collaborative system could be expanded to include a diverse range of skills. This research identified that those who are involved in family businesses tended to remain working despite age although the nature of the work changed to accommodate normal ageing processes such as reduced fine-motor control.

The main barriers to engaging in post-retirement employment included a recognition of transferable skills, flexibility in employment agreements and social spaces to communicate with others. Shared acknowledgement of the needs of the prospective employee and employer would support positive working agreements which can accommodate the particular age related sensory and physical changes which frequently occur. These can be addressed by the introduction of the proposed collaborative workspace to support small businesses who seek flexible expertise and are willing to appreciate the many advantages which older people can bring.

Older people did tend to have particular concerns about privacy when using digital technologies. This may mean that safeguards may need to be in place to enable both easier logging in processes but also to provide limited identifiable details of users. Related to this perception of privacy breaches relates to the use of online banking which very few participants used.

Barriers to securing and maintaining employment in the UK, which this research cannot address, include the infra-structure of variable robust broadband and phone services and public transport for those who can no longer drive. Other motivations,

such as the need to financially supplement pensions and maximize wellbeing may become more important as the demographics and economic aspects change.

7 References

Fasbender, U; Deller, J; Wang, M and Wiernik, B.N (2014) *Deciding whether to work after retirement: The role of the psychological experience of aging. Journal of Vocational Behaviour. 84. P. 215-224*

Fast, J; de Jong Giervald, J (2008) *Ageing, disability and participation. In Keating, N (ed). Rural Ageing: a Good place to Grow Old? Policy Press, Bristol*

Gilsky, E.L *Changes in Cognitive Function in Human Aging in Riddle, DR (eds) Brain Aging: Modles, Methods and Mechanisms (2007). Boca Raton (FL); CRC Press.*

Hawkins, HL; Kramer, AF (1992) *Aging, exercise and attention. Psychological Aging 7, 643.*

Peek, STM; Wouters, EJM; Hoof, J; Luijkx, K G; Boeiji, HR and Vrijhoef, HJM (2014) *Factors influencing acceptance of technology for aging in place: a systematic review. 83.p. 235-248*

Sargent, L.D; Bataille, C.D; Vough, H.C and Lee, M.D (2011) *Metaphors for retirement: unshackled from schedules. Journal of Vocational Behaviour 79.p.315-324*

Stössel, C. a. (2010). *swipe & pinch: Designing suitable multi-touch gestures for older users. . Proc. DESIGN, 463-472 .*

Taylor, M.J; Stables, R; Matata, B et.al (2014) *Website design: Technical, social and medical issues for self-reporting by elderly patients. Health Informatics Journal vol 20 (2) 136-150*

Wöhrmann, A.M; Deller, J and Wang, M (2014) *A mixed-method approach to post-retirement career planning. Journal of Vocational Behaviour 84. P. 307-317*

Zhou, J; Rau, P; Salvendy, G (2013) *Older adults' use of smart phones: an investigation of the factors influencing the acceptance of new functions. Behaviour & Information Technology 33, 6, 552-560*

8 Appendices

Questionnaire

Elders Up!

Individual Users Questionnaire

Skills & Expertise

What professional expertise and skills do you have?

What professional expertise and skills would you like to use again?

Are there any new skills you would like use instead? (such as new interests)

What professional expertise and skills that you have would be useful to small businesses, start-up businesses, or young companies?

Motivation & Reward

In exchange for providing your expertise and skills to companies what rewards would you expect?

(please tick all that apply)

- monetary reward;
- the work is rewarding in itself;
- helping others is reward enough;
- shopping vouchers;
- the social contact;
- working with young people;
- working with young companies/start-ups;
- you expect a commercial level of reward/ fee for commercial work;
- other

Would you prefer to provide your expertise/skills to:

- other elderly people
- to young people

- to companies
- to charities
- to public organisations such as NHS?

How much time would you be prepared to spend providing your expertise/ skills for one piece of work?

- 1 afternoon of time;
- 1 day;
- several days;
- 1 week;
- 2-3 weeks;
- 1 month;
- several months.

How often per year would you be prepared to provide your expertise/skill?

- once;
- 2-3 times a year;
- 4-6 times a year;
- every month;
- other; please state

Adaptations

Have you made any changes to your settings on your device to support your use?

This may be changing font sizes, background colours, using plug in devices, speech recognition software, etc.

Please list here;

Elders Up – System: ease of use

We propose designing a website which will support you and small businesses in making contact with each other by a matching your skills and expertise to businesses with needs. We need to know what you think would work best for you.

The following questions are about how you would most likely use the site, from registration to making contact with companies.

Making a profile and registering on the site

Would you prefer to fill out one form at the beginning of your registration?

- yes no

Would you prefer to use free text boxes to put your information into?

- yes no

Or have pop up question and answer boxes that collect the information from you in a more intuitive way?

- yes no

Would you like your entries to be saved automatically?

- yes no

Would you like to be able to use interactive messaging as you complete the form?

- yes no

Would you like to have the option to complete and edit your profile in several episodes rather than all in one go?

- yes no

Matching Service

Would you prefer:

- to be notified about new requests for expertise/skill by companies?
 browse a list of requests?
 both of the above?

How often would you like the system to notify you of new requests?

- as soon as they are entered
 once a day
 once a week
 once a month

Do you think providing an online forum option would be useful? This could be a forum to share issues with other users registered with the service.

yes no

Privacy

This question is about the amount of personal data the site would require.

We need to know what sort of personal data you would be happy to share and with whom.

Please tick the boxes you agree with.

	<i>Public view Everyone</i>	<i>Private settings Only you and others approved by you</i>	<i>Group only i.e. only registered site users</i>	<i>None of these</i>
Full name				
Site ID name				
Age				
Date of Birth				
Male/Female				
Location				
Full address				
email				
Skype ID				
phone				
mobile				
Previous employer				
Previous job title				
Expertise& skills				
Job commission history				
Home working only				
Pay rates				
Other				

Thank you for your help

Optional

We would like to know a little more about you. These details will be kept confidential and not distributed beyond the research staff.

Name:

Address:

Age:

Gender:

Educational level:

If you are willing to be contacted in the future about the research then please leave a contact number or email address;

Elders Up!

www.eldersup-aal.eu

8.1 Appendix 2 Participant Characteristics

The research included observational site visits to 2 community groups in different locations. Group 1 was an established computer group for the over 50s, although the majority of members were over 65 years of age. This group was characteristically composed of highly educated and professional class of people, with doctorate as the highest level of educational attainment

Group 2 consisted of a wider range of older people, many of whom also experienced chronic illness and conditions which limited mobility and fine motor movements. This group were mostly over 70 years of age with the highest level of educational attainment at first degree level. Many were working in family related businesses and lived in more rural areas. This group of participants frequently experienced disruptive and slow internet connections.

Additionally a small group of older people living in a retirement village were contacted about the research and provided some returned questionnaires. This group were positive about the benefits of the proposed collaborative website but felt it was not relevant to their lives as they enjoyed their retirement.

The data collection consisted of semi-structured interviews, short conversations and observations of using technologies, questionnaires and 3 focus groups. 11 questionnaires were returned of which only 6 were fully completed. Interviews were generally very productive lasting 45 minutes; only 2 were digitally recorded out of 5. The total number of group visits was 6, each lasting at least 1 hour. The number of participants including those who agreed to be observed totalled 32 individuals.