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Utilizing ICT to prevent loneliness and social isolation of the elderly. A literature review

Utilizando las TIC para prevenir la soledad y el aislamiento social de las personas mayores. Una revisión literaria

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Abstract
Ageing of the population is a worldwide phenomenon. Numerous ICT-based solutions have been developed for elderly care but mainly connected to the physiological and nursing aspects in services for the elderly. Social work is a profession that should pay attention to the comprehensive wellbeing and social needs of the elderly. Many people experience loneliness and depression in their old age, either as a result of living alone or due to a lack of close family ties and reduced connections with their culture of origin, which results in an inability to participate actively in community activities (Singh & Misra, 2009). Participation in society would enhance the quality of life. With the development of information technology, the use of technology in social work practice has risen dramatically.
The aim of this literature review is to map out the state of the art of knowledge about the usage of ICT in elderly care and to figure out research-based knowledge about the usability of ICT for the prevention of loneliness and social isolation of elderly people.
The data for the current research comes from the core collection of the Web of Science and the data searching was performed using Boolean? The searching resulted in 216 published English articles. After going through the topics and abstracts, 34 articles were selected for the data analysis that is based on a multi approach framework. The analysis of the research approach is categorized according to some aspects of using ICT by older adults from the adoption of ICT to the impact of usage, and the social services for them. This literature review focused on the function of communication by excluding the applications that mainly relate to physical nursing. The results show that the so-called 'digital divide' still exists, but the older adults have the willingness to learn and utilise ICT in daily life, especially for communication. The data shows that the usage of ICT can prevent the loneliness and social isolation of older adults, and they are eager for technical support in using ICT. The results of data analysis on theoretical frames and concepts show that this research field applies different theoretical frames from various scientific fields, while a social work approach is lacking. However, a synergic frame of applied theories will be suggested from the perspective of social work.
Keywords: ICT, older adults, loneliness, social isolation.

Resumen
El envejecimiento de la población es un fenómeno mundial. Se han desarrollado numerosas soluciones basadas en las Tecnologías de la información y la comunicación (TIC) para el cuidado de ancianos, pero concentradas principalmente en los servicios relacionados con aspectos fisiológicos y de enfermería. El Trabajo Social es una profesión que tiene que prestar atención al bienestar integral y a las necesidades sociales de las personas mayores. Muchas personas sufren soledad y depresión en la vejez, ya sea como resultado de vivir solas o debido a la falta de lazos familiares y a la reducción de las conexiones con su cultura de origen. Todo ello desemboca en una incapacidad para participar en las actividades comunitarias (Singh y Mishra, 2009). La participación en la sociedad mejoraría su calidad de vida. Con el desarrollo de la tecnología de la información, su uso en la práctica del Trabajo Social se ha visto incrementado notablemente.
El objetivo de esta revisión bibliográfica consiste en trazar el estado actual del conocimiento sobre el uso de las TIC en el cuidado de las personas mayores y saber cuál es el estado de la investigación acerca de la capacidad de uso de las TIC para la prevención de la soledad y el aislamiento social de las personas de edad avanzada.
Los datos de esta investigación provienen de la colección básica de la *Web of Science*, y su búsqueda se ha realizado con operadores «booleanos», cuyo resultado ha sido el hallazgo de 216 artículos publicados en inglés. Después de revisar los temas y resúmenes, se seleccionaron 34 artículos para el análisis de datos en el marco de varios enfoques. El análisis de los enfoques de investigación se clasifica de acuerdo con el proceso de acceso a las TIC por las personas mayores y la adopción de las mismas para su uso, y el servicio social que se les presta a ellos. Esta revisión bibliográfica se centró en la función de la comunicación, excluyendo las aplicaciones que se relacionan principalmente con la enfermería física. Los resultados muestran que, aunque todavía existe la llamada «brecha digital», las personas mayores tienen la voluntad de aprender

y utilizar las TIC en su vida cotidiana, especialmente en el ámbito de la comunicación. Se ha demostrado que el uso de las TIC puede prevenir la soledad y el aislamiento social de los personas mayores, y que están muy interesadas en ampliar su conocimiento en el uso de las TIC.
El resultado del análisis de los datos obedece a unos marcos teóricos y conceptuales diversos que muestran que en este campo de investigación su diversidad teórica procede de múltiples campos científicos, pero que se echa en falta una aproximación desde la perspectiva del Trabajo Social. Por ello, se sugiere la elaboración de un marco sinérgico de teorías que se apliquen con la perspectiva del Trabajo Social.
Palabras clave: TIC, personas mayores, soledad, aislamiento social.

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Summary: Introduction. 1. Data. 2. Results. 3. Discussion. 4. Conclusion and limitation. 5. References.

Introduction

Ageing of the population is a worldwide phenomenon. By 2050, 22% of the world's population will be aged 60 or over (WHO, 2012). Social work as a profession should pay attention to the comprehensive wellbeing and social needs of older adults. With the development of information technology, the use of technology in social work practice has risen dramatically (Parker-Oliver & Demiris, 2006). Numerous ICT-based solutions have been developed to counter ageing-related challenges but mainly for the physiological and nursing aspects in the services for the elderly. Many people experience loneliness and depression in their old age, either as a result of living alone or due to a lack of close family ties and reduced connections with their culture of origin, which results in an inability to participate actively in community activities (Singh & Misra, 2009). A common understanding in many cultures holds that active participation in society would enhance the quality of life. The relational understanding of wellbeing highlights the positive effect of human activity and participation in local communities and society (Hirvilammi & Helne, 2014). Considering the physical limitations of elderly, online communication might be an option for the elderly to keep connected with people and the community. This study figures out what kind of research-based knowledge is available concerning the question of whether or not the loneliness and social isolation of older adults can be prevented through the usage of ICT. Based on these results, the applicability of ICT is reflected on as a tool of social work practice with the elderly in various vulnerable situations. This provides evidence of what the needs of social work practice are to prevent the loneliness and social isolation of the elderly.

ICT has been developing rapidly in the past decade. Still, research about the usage of ICT by seniors is limited. As such, there is limited empirical research on this topic. A literature review is used to produce a description on the state of existing knowledge (Machi & McEvoy, 2009). The first focus of the research review is put upon the motivation to use ICT, under which conditions the older adults have the willingness to access ICT and what inspires or encourages them to use ICT. Also, knowledge concerning the barriers for older adults who have the motivation to use ICT will be analysed. On the basis of the result from these two questions, the impact of using ICT among older adults will be summarised in order to find a way to prevent the loneliness and social isolation of older adults through the usage of ICT. Finally, the dada analysis will find out which kinds of theories and theoretical concepts are applied to analyse older adults using ICT in order to suggest a theoretical framework for the following research of this topic.

1. Data

A literature search was performed at the end of October, 2015 from the core collection of the Web of Science, an online subscription-based scientific citation indexing service maintained by Thomson Reuters. The research review was limited to English language articles (no books or other types of publications were included). There was no time limitation to the data search. A set of 34 articles (Figure 1) were selected as data for the current research. An advanced search has been performed with two Boolean operators from

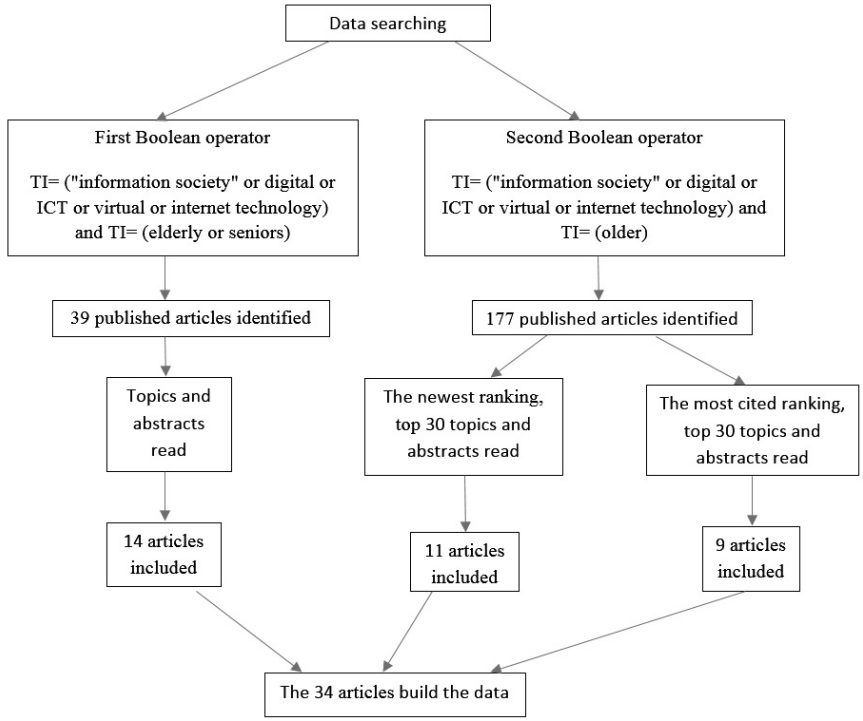

Figure 1. Data Searching Process (TI: tittle).

the core collection of the Web of Science. The Boolean operator allows the searching strategy to be specified and limited. Articles were included in the data if (a) the sample populations were aging people, (b) the focus was on the usage of digital equipment among elder people or the social services provided seniors with the knowledge of how to use digital equipment for communication functions and (c) the outcome related to the social interaction of elderly people.

The first Boolean operator was *TI = («information society» or digital or ICT or virtual or internet technology) and TI = (elderly or seniors)*. The data search formula was composed by the title (TI). Based on the previous study, the topics of the data search were as follows: information society, as a phase, digital, ICT, virtual or internet technology. The search resulted in 39 published articles. After going through all the topics and abstracts, 14 articles were selected. Due to a lack of results, a second Boolean operator was created: *TI = («information society» or digital or ICT or virtual or internet technology) and TI = (older)*. The result of the second search comprised 177 published articles. Based on the topic and abstract after ranking by the most cited, 9 articles were selected from the newest published list and by the same process 11 articles were selected for the research review. The data search resulted in the 34 newest and most citied and topically most relevant English peer-reviewed articles which could hopefully provide data to answer the research questions.

A multi-approach framework was used for the data analysis, which was thematically categorised according to the research contents related to the various steps in the process of accessing ICT by older adults. The themes in the research articles were categorised into four main groups (see Figure 2): ICT adoption, impacts on quality of life, the support of social services and theories used in articles. The usage, the motivation and willingness were analysed to figure out the older people's attitudes to ICT. In the disadvantages of ICT adoption by older adults could be found the limitations of older adults which restricted their experience of ICT utilisation.

After looking at the data using the above approaches, the data analysis focused on the social services which have been provided to support older adults in using ICT. These services contained ICT innovations for older adults and the projects offered orientation for using ICT that was targeted at older adults.

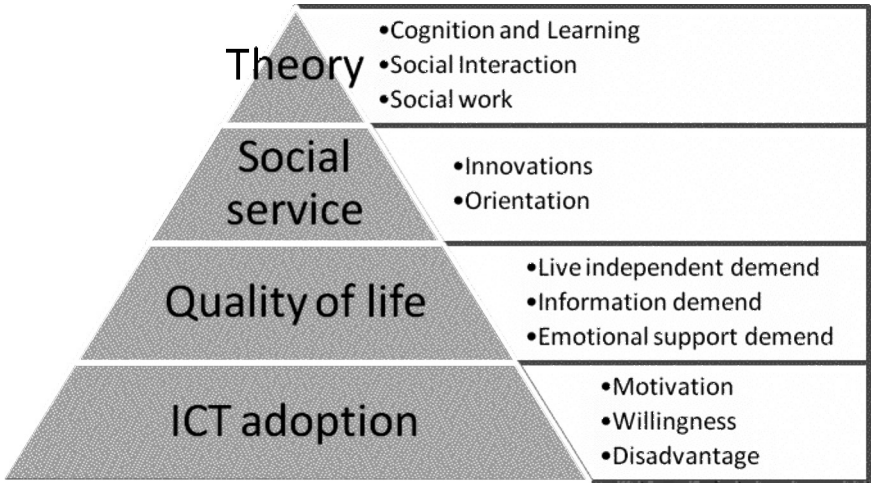

Figure 2. Framework for Data Analysis?

2. Results

2.1. Overview of the data

A summary of the knowledge from the data which answer to the research question shows in Table 1. Although the language of the articles was English, it is significant that most of the researches were conducted in developed countries which correspond to the imbalance development of ICT in different regions. The first article was published in 2006 (Lam & Lee, 2006), which was a longitudinal study of internet adoption by older adults. It was the period when SNS (social networking sites) were blooming after the foundation of Facebook in 2004 and Twitter in 2006.

The majority of the analysed articles were based on quantitative data (n = 20, 59%). Three articles (Godfrey & Johnson, 2009; Lia Hern, Modesta, Beni, & O Omez-Zú, 2009; Gustafson *et al.,* 2015) used both quantitative and qualitative methods. In the three articles, the impact factors of research questions were analysed by a quantitative method, but a qualitative method was applied to interpret the results. The concept of digital divide refers to «the social, economic, and demographic factors that exist between individuals who use computers and those who do not» (Cresci & Jarosz, 2010). The articles had different perspectives regarding the usage of ICT among older adults, but a common aim of the researches was to prompt the wellbeing and quality of life of older adults by bridging the gap of the so-called «digital divide». Demographic factors have been widely demonstrated to have an important impact on the usability of ICT, such as gender, age and education. In some articles, race or ethnicity were considered a factor (Cresci, Yarandi & Morrell, 2010). Based on the analysis of the statistical data that was presented in some of the articles, younger age, higher education level, more wealth, better health and literacy are more involved in the use of ICT. The rank of the above mentioned demographic factors differed between the studies, and it still remains uncertain as to which factors have the foremost influence. Besides the demonstrated factors, the inadequacy of knowledge on using ICT had always been reported as a main reason for the lack of usage of ICT among elderly people.

Gender was an important factor in many of the published articles. The results were also somewhat contradictory, for example, some quantitative researches showed that men are more active in using ICT (Pan & Jordan-Marsh, 2010; Agudo Prado, Pascual Sevillano, & Fombona Cadavieco, 2012; Näsi, Räsänen, & Sarpila, 2012), whereas some qualitative researches focused on females as the main subject of research (Lin, Tang, & Kuo, 2012; Tsai, Shillair, Cotten, Winstead, & Yost, 2015). There was a common understanding that men would have better cogitation on technical knowledge but that females would be more eager to connect with families. But, there was no evidence that men do not need ICT or that they do not need a service on learning to use ICT. Further studies could involve more male participants in this situation, and studies on the ICT adoption of older men could be

Article (time order)	Country of research focus	Research method	Purpose/ manner of ICT usage	Target group of the elderly	Usefulness of ICT against loneliness?	Social Work practice relevance?
Lam & Lee, 2006	Hong Kong, China	Quantitative	Digital inclusiveness	Age 55+, N ≅ 1000	Outcome expectations on usage intention	Support and encouragement in the information of self-expectation
Sokoler & Svensson, 2007	Sweden	Qualitative	Social interaction	Age 55+, N = 10	Technology design for social challenges	Non-stigmatisation
Peacock & Künemund, 2007	Germany	Quantitative	Internet access and motivation	Data from a survey cover 15 European countries Age 55+, N = 5091	Lacking facilities and knowledge are part of the reasons of older citizens who are offline	Promote technical support in community and more ICT facilities should provide for public service
Fokkema & Knipscheer, 2007	Netherlands	Quantitative	Decrease loneliness	Age average 65, N = 15	The more social functions of the internet are used the more loneliness could decline	Provide social service on using ICT for social functions
Carmichael, Newell & Morgan, 2007	UK	Quantitative	Usable technology	Video recordings on seniors using ICT	Meeting and interacting with older users of ICT should be implied in design process to collect their needs	Understanding the needs of older users in using ICT could benefit the social work service for elderly people
Sum *et al.,* 2008	Australia	Quantitative	Social capital and wellbeing	Age 55+, N = 222	Internet can be helpful when used with awareness	Provide guide for using ICT
Godfrey & Johnson, 2009	UK	Review	Information need	Research on older people's information needs	How the use of informal network support by technology can benefit older people	Using emerging technology improves the digital network support for older persons
Lia Hern *et al.,* 2009	Spain	Quantitative Qualitative	ICT adoption, learning of using ICT	Age 65+, N = 13 (Quantitative) Age 65-70, N = 7 (Qualitative)	Usability, attitudes, experience and perceived benefits are key aspect of older people's ICT adoption	Adjustments of the technology based on gerontology are needed
Cresci & Jarosz, 2010	USA	Qualitative	Proving health and wellbeing	Adults age 21-61, (N = 5) Age 62+, (N = 30)	Lacking knowledge and access to ICT	Community-university partnership
Jung *et al.,* 2010	USA	Quantitative	Motivation	Low income immigrant seniors, N = 91	Benefit from enrol in the Cybercafé for social support etc.	Organize learning events for vulnerable groups

Article (time order)	Country of research focus	Research method	Purpose/ manner of ICT usage	Target group of the elderly	Usefulness of ICT against loneliness?	Social Work practice relevance?
Cresci, Yarandi & Morrell, 2010	USA	Quantitative	Motivation	Age 65+, N=1410	Significant differences or not of demographic and health-related factors on user	Focus on seniors with special needs for using of ICT
Pan & Jordan-Marsh, 2010	China	Quantitative	Internet adoption	Age 50-81, N=374	The financial cost and lacking of suitable facilities limited the Chinese seniors' access to the Internet. They could not get technical support from family due to the living distance, they would like peer group support	Promote senior centred internet facilities which are low cost Organise a peer group when learning to use internet facilities
B. De Schutter, 2010	Belgium	Quantitative	Digital game adoption	Age 45-85, N=124	Digital games could bring gratification for seniors. Social interaction is an important predictor of how long they will play	Introduce seniors to play some casual games with social interaction.
Ordonez, Yassuda & Cachioni, 2011	Brazil	Quantitative	Computer learning	Age 60+, N=42	Cognition can be improved by learning new knowledge or using a new tool such as access to internet	Enabling to provide new services for the elderly
Chen *et al.,* 2011	Taiwan, China	Quantitative	Learning, technology services	Age 61-70, N=450	Digital broadband network technology services provided via television	The digital facilities could implied in the seniors' house
Näsi, Räsänen & Sarpila, 2012	Finland	Quantitative	Internet use	Age 60-79, N=542	Leisure activities using the internet is a positive correlation among Finnish seniors	Improvement of social work service by using ICT
Lin, Tang & Kuo, 2012	Taiwan	Qualitative	Social intervention, ICT leaning	Age 40-66 women, N=28	Learning though social support	Organize or promote peer support group
O'Mara, 2012	Australia	Qualitative	Wellbeing	Elderly women from the Vietnamese community, N=38	Using digital technology to improve communication	Organise or promote peer support group, enabling seniors to use online resources

Article (time order)	Country of research focus	Research method	Purpose/ manner of ICT usage	Target group of the elderly	Usefulness of ICT against loneliness?	Social Work practice relevance?
Ng, Lim, Niti & Collinson, 2012	Singapore	Quantitative	Digital mobile phone use	Age 55+, N=871	Digital mobile phone users might have lower risks of cognitive decline	Using digital phone may have an independent facilitating effect on global and executive functioning
Agudo Prado, Pascual Sevillano & Fombona Cadavieco, 2012	Spain	Quantitative Qualitative	Learning, healthy living	Elderly, N=215	Seniors are using digital tools for education, information, communication and entertainment	Most seniors access internet form public service, more ICT facilities should be provided for elderly service
Niehaves & Plattfaut, 2013	Germany	Quantitative	Internet adoption	Age 65+, N=150	Age-related digital divide prevents them using ICT to enhance life quality	Enabling to provide new services for the elderly
Bobillier Chaumon *et al.,* 2013	France	Qualitative	Quality of life	Mean Age 87, N=17	Improve intellectual and interactional capacities	Apply ICT facilities for a service for seniors who have lost intellectual and interactional capacities
Choi & Dinitto, 2013	USA	Quantitative	Internet using, attitudes towards use of internet or computer	Recipients of home-delivered meals, N=980 (78% Age 60+)	Discontinuing internet use due to cost and disability and the lack of technology	Reduce the digital divide among individuals
Heart & Kalderon, 2013	Israel	Quantitative	Health-related ICT adoption	Age 60+, N=123	ICT can improve the quality of life although the elderly are not ready to use it.	Health-related ICT should be simple, special training for specific personal and cultural characteristics is needed
Allaire *et al.,* 2013	USA	Quantitative	Wellbeing	Age 63-92, N=140	Playing digital games may serve as a positive activity associated with successful aging	Introduce some digital games suitable for seniors to use
Levy, Janke & Langa, 2014	USA	Quantitative	Access to online information of medical record	Age 65+, N=2408	Less use of online healthy information associated with low health literacy	Bridge the gap of age related digital divide

Article (time order)	Country of research focus	Research method	Purpose/ manner of ICT usage	Target group of the elderly	Usefulness of ICT against loneliness?	Social Work practice relevance?
Bob De Schutter, Brown & Abeele, 2014	USA	Qualitative	Media adoption	Age 49-73, N=35	Culture, gender and knowledge are factors that impact on the adoption of digital games for older players	Consider the differences among seniors when providing services for them though ICT
Wu, Damnée, Kerhervé, Ware & Rigaud, 2015	France	Qualitative	ICT adoption	Age 63-88, N=23	Older adults adopt ICT to fit in with the society, they need technical support	Provide technical support in the local community and organise peer support
HUNTER, 2015	UK	Qualitative	Communication and family relationship	Age 55-75, N=25	The use of ICT helps older migrants connect with home country but also brings more responsibilities	Provide support for migrants on social interaction in local community
Tsai, Shillair, Cotten, Winstead & Yost, 2015	USA	Qualitative	Technological self-efficacy	Age 69-91, N=21	Using tablets improve the quality of life, decreased feeing of loneliness and depression, increased independence and personal growth	Sharing the successful cases of using tables with the non-users to show helpfulness of ICT
Hill, Betts & Gardner, 2015	UK	Qualitative	Enhance life activity and increase social network	Age 54-85, N=17	Overcome physical barriers Reduce loneliness	Improving the welling of elderly people by using ICT
Hall, Bernhardt, Dodd & Vollrath, 2015	USA	Quantitative	Improve quality of care and health outcome	Age 50-92, N=225	Healthy digital divide is significant	Provide health education program to promote health information technology use
Gustafson *et al.*, 2015	USA	Quantitative Qualitative	Quality of life among elderly people and their caregivers	Users of a ICT program N=392	A program could improve the quality of life	Could be a demand for a ICT programme targeted to enhance the relationship between elderly people and their caregivers
Beer, Smarr, Fisk & Rogers, 2015	USA	Quantitative	Recognition of virtual emotion	1. Age 18-26, N=31 & Age 65-85, N=29 2. Age 18-28, N=42 & Age 65-85, N =42	Older users show lower recognition of virtual emotion	The virtual services for seniors should pay more attention on virtual emotion design

Table 1. Summary of articles.

done beforehand. Another factor found in the articles was the relationship status of the female participants. They were mentioned as either «Grandma» or «Mom», which strong implies the role of women in the family. Hence, the terms «Grandma» or «Mum» should be used carefully in further research of older adults using ICT as they should be respected as an individual and not just as some women in the family.

2.2. The information and communication technology adoption of older adults

The difference in the motivation has been shown to be the major category, after accessibility to the internet, that explains the ICT usage among the older adults (Peacock & Künemund, 2007). Basically, older adults have been facing two types of information and communication technology in daily life: one has been designed for the older adults and reflects the potential cognitive impairment and physical disabilities of them, and the other has been designed for the population in general without taking into consideration the age gap. The principle of ICT devised for older adults has been to help them live independently as long as they can without losing a connection with society (Choi & Dinitto, 2013) Prevention of social isolation has been seen to be the primary motivation for using ICT. Researches have illustrated that older adults have the desire to adopt the latest technology (Lin, Tang & Kuo, 2012) and interact with others via ICT (De Schutter, 2010). However, some of the older adults have been users of ICT already before retirement (Peacock & Künemund, 2007; Näsi, Räsänen & Sarpila, 2012; Tsai Shillair, Cotten, Winstead & Yost, 2015). The older adults have been inspired or encouraged by friends or relatives to start surfing the internet (Lam & Lee, 2006; Fokkema & Knipscheer, 2007; Peacock & Künemund, 2007; Sokoler & Svensson, 2007; Cresci & Jarosz, 2010; Cresci, Yarandi & Morrell, 2010; Agudo Prado, Pascual Sevillano & Fombona Cadavieco, 2012; Bobillier Chaumon *et al.,* 2013; Niehaves & Plattfaut, 2013; Tsai, Shillair, Cotten, Winstead & Yost, 2015).

The ICT has been seen to provide a convenient and effective approach to communicate with others, and it also has assisted the older adults in receiving information that interests them. Especially the older adults who have been experiencing some illness gain benefit from the resources provided by peer groups, which are credible and updated regularly (Fokkema & Knipscheer, 2007; Cresci & Jarosz, 2010; Pan & Jordan-Marsh, 2010; Näsi, Räsänen, & Sarpila, 2012; O'Mara, 2012; Choi & Dinitto, 2013; Heart & Kalderon, 2013; Tsai, Shillair, Cotten, Winstead & Yost, 2015; Hall, Bernhardt, Dodd & Vollrath, 2015). The emotional support among peer group members has also been a positive impact of using ICT (Gustafson *et al.,* 2015).

It has also been shown that there is an objective reason for using ICT, which motivates elderly people to learn to use these technologies. The older adults have sometimes had to use online technology to «do tax declaration and buy tickets» (Wu, Damnée, Kerhervé, Ware, & Rigaud, 2015) because there are often no other options. But they have gained also further knowledge of the internet after the experience of buying tickets and have started exploring other functions such as communication. Meanwhile, more online health information systems have been invented that older adults could benefit from but only if they would know how to use such sources (Levy, Janke & Langa, 2014; Hall, Bernhardt, Dodd & Vollrath, 2015).

According to the statistics from different regions, people aged over 55 have had lower exposure to ICT compared to other age group (Lam & Lee, 2006; Näsi, Räsänen & Sarpila, 2012; Tsai, Shillair, Cotten,Winstead & Yost, 2015; Wu, Damnée, Kerhervé & Ware, 2015). An obvious reason is the limitation of the cognitive and physical function of older adults. Other closely related factors have been found from the data of the current research, such as «not needed» or «not interested» (Fokkema & Knipscheer, 2007; Heart & Kalderon, 2013). A qualitative research (Wu, Damnée, Kerhervé, Ware & Rigaud, 2015) has indicated that some older adults are still unable to use ICT facilities due to the economic cost of the facilities and internet. They have also been worried about «breaking it» because of incorrect use. They were concerned about the cost of the security; some older adults were anxious about safety, and they were worried that others would «get their addresses» or other identity information. They were also worried that their human nature might be changed by ICT (idem). Even if they conquer the fear of economic and security danger, older adults have found that they could not receive good technical support in the

use of ICT. Lin, Tang & Kuo (2012) addressed the social supports for elderly women learning ICT and found that some elder women complained that their families were impatient to help them to use ICT. Although some relatives were happy to help, older adults reported that they could not understand the guidance from the younger generation because they did not understand the concepts or terms (Wu, Damnée, Kerhervé, Ware & Rigaud, 2015). Furthermore, to avoid the stigma which may be caused by being eager to use ICT, the older adults were afraid of being tagged as suffering from loneliness as they have the intention to use ICT for communication (Sokoler & Svensson, 2007).

2.3. Improving the quality of life through the use of ICT

Studies (Fokkema & Knipscheer, 2007; Hill, Betts & Gardner, 2015; Tsai, Shillair, Cotten, Winstead & Yost, 2015) have demonstrated that the usage of ICT can decrease the feeling of loneliness and social isolation. Evidence from the data showed that the usage of ICT can significantly improve and enhance the quality of life among older adults (Fokkema & Knipscheer, 2007; Bobillier Chaumon, Michel, Tarpin Bernard & Croisile, 2013; Heart & Kalderon, 2013; Niehaves & Plattfaut, 2013; De Schutter, Brown & Abeele, 2014; Gustafson *et al.,* 2015; Sokoler & Svensson, 2007; Beer, Smarr, Fisk & Rogers, 2015; Tsai, Shillair, Cotten,Winstead & Yost, 2015; Wu, Damnée, Kerhervé, Ware & Rigaud,, 2015) and that digital games can even lead to «successful aging» (Allaire, McLaughlin, Trujillo, Whitlock, LaPorte & Gandy, 2013). Firstly, the assistant function of ICT has been shown to offer older adults the opportunities and resources for independent living as long as they want (Cresci & Jarosz, 2010; Niehaves & Plattfaut, 2013; Sokoler & Svensson, 2007). This has not only been the desire of older adults themselves, but also that of the service agencies, because in the current situation of elderly care resources for institutional care have been lacking. Then the older adults can easily catch on to the rapidly updated information from the ICT devices, especially in regard to health related information. The health related information has usually been accessed from health-related internet sites (Heart & Kalderon, 2013) and the e-health service of the local authority (Hall, Bernhardt, Dodd, & Vollrath, 2015; Levy, Janke & Langa, 2014). Older adults who have been suffering chronic illness have the possibility to get specific information on their disease (O'Mara, 2012).

The articles included in the data have shown that the emotional needs of older adults have built up around them a significant focus on innovations, research and services for the elderly (Fokkema & Knipscheer, 2007; Allaire, McLaughlin, Trujillo, Whitlock, LaPorte & Gandy, 2013; Beer, Smarr, Fisk & Rogers, 2015; Hill, Betts & Gardner, 2015). As the out-migration of young people has become more common in several countries, the older generation sometimes have been left alone without enough emotional support due to social isolation, which leads to loneliness (Yamada & Teerawichitchainan, 2015). The sustained and effective social interaction with the assistance of ICT has produced a virtual social life for older adults, and especially those who have physical limitations or who live in remote regions.

From the perspective of the impact of using ICT, some target groups have been studied separately such as grandmothers, patients with chronic diseases and migrants. Migrants have benefitted from the services of ICT to maintain kinship in a foreign country (Georgiou, Ponte & Cola, 2013), and some researchers have presented that ICT could help the migrants back to their home county. However, Hunter (2015) came to a comprehensive conclusion based on a qualitative study: that the usage of mobile phone provides a convenient way for communication. This bond has also lead migrants to take more financial responsibility of taking care of the relatives in their home country. Because of the availability of online money transfer services, some migrants have needed to respond to the financial needs of their families right after they have called instead of sending money once per month (Hunter, 2015). This responsibility has brought pressure to the older migrants. Some of them confirmed during the interviews that they have been afraid even of answering phone calls from family members because they know that will be required to send money back home immediately (idem).

2.4. Social services and ICT

Over the past decades, no other innovations have had such significant impacts on working and li-

ving environments as has information and communication technology (Holden, Bearison, Rode, Rosenberg & Fishman, 1999). Stemming from the rapid increase of ICT innovation, more social services have been expanding the digital services which can be accessed by internet. Several projects have been presented in the review data, which have addressed the assistive technologies like «@home» (Doukas, Metsis, Becker, Le, Makedon & Maglogiannis, 2011) as one such innovation. Monitoring technologies have also continued to develop steadily although these innovations have always been associated with ethical concerns; for example, «SWEET-HOME» is a monitoring innovative frame with an audio and video consultation setting (Robert *et al.,* 2013). Considering the information, especially the communication function, «Leeds Link-Age Plus» (Godfrey & Johnson, 2009) has aimed to meet the requirement of information for older adults. «Elder Tree» (Gustafson *et al.,* 2015) is a multifaceted intervention which has created an alternative role for older adults. The users can access services with «Elder Tree» while providing informal care for other older users. This innovation has led to a result that demonstrates a possibility to escape loneliness and reduce healthcare costs among older adults (Gustafson *et al.,* 2015).

Based on the result of the adoption of ICT, the inadequacy of efficient technical supports has been the main reason that obstructing older adults from using ICT. Against this background, projects aiming to find a strategy for bridging the gap of the digital divide have been conducted for older adults. A female targeted project (Lin, Tang, & Kuo, 2012) created an orientation of internet surfing among older adults though social support. Some projects have indicated that older adults prefer to have peer support other than from a family member or a professional (Lin, Tang & Kuo, 2012; Niehaves & Plattfaut, 2013).

2.5. Theoretical approach in the studies on the elderly using ICT

Different theatrical approaches have been applied in the articles. The data analysis of theoretical knowledge has been formulated (see Figure 3) based on the process of the ICT adoption. Three separate layers were selected for the analysis: (1) the cognition and learning behaviour on the adoption of ICT, (2) the social interaction as the impact of the usage of ICT and (3) the theories from a broader social work perspective.

Cognition and learning theories have been the basic knowledge of innovation of ICT for older adults, and social services have aimed to advise older adults to use ICT. In Lam and Lee's (2006) longitudinal study a theoretical model was developed based on social cognitive theory. The self-efficacy theory (Bandura, 1982) was used to study the impact of ICT on older adults' quality of life (Hall, Bernhardt, Dodd, & Vollrath, 2015). The technology acceptance model (Davis, 1985) has been employed in two articles to explain individual technology usage beha-

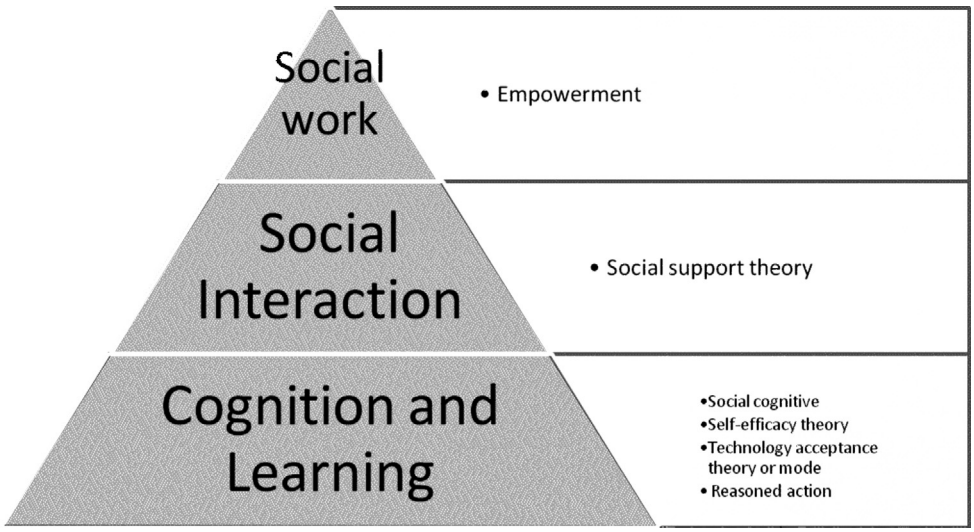

Figure 3. Theoretical approaches of researches in regard to usage of ICT by older adults.

viour (Niehaves & Plattfaut, 2013) and to examine the determinants of Internet adoption behaviour (Pan & Jordan-Marsh, 2010). The following theories were also reviewed in the articles as a background to cognition and learning theories: reasoned action (Lam & Lee, 2006; Chen, Lu, Chen, & Liu, 2011; Niehaves & Plattfaut, 2013); technology acceptance theory (Niehaves & Plattfaut, 2013); theory of planned behaviour (Heart & Kalderon, 2013); and self-determination theory (Gustafson *et al.,* 2015).

Social interaction has been the main consequence of using ICT, and social support theory has been implied in the research (Lin, Tang & Kuo, 2012) with aim to improve the social interaction of older adults. According to Hobfoll and London (1986), women have taken social support as a key resource because of their emotional cognition, and those women have been more willing to help others with communication skills that could enable their network. In the theoretical frameworks a significant shortcoming has been demonstrated in the theories in regard to the usage of ICT by elderly people, especially in regard to the loneliness and social isolation of older adults as social phenomena are rarely illustrated. Instead, the psychological and sociological theories related to the cause of loneliness and social isolation of older adults have been studied in these articles from past decades. Until now, the theories have mostly been from disciplines other than social work. Empowerment has been a widely discussed social work theory. The fundamental understanding of empowerment has been the self-decision and self-achievement of the service users themselves. In a case study from the data, the self-empowerment training programmes have helped to mitigate cultural barriers with elderly women from Vietnam (O'Mara, 2012). Empowerment has been seen to be a strong support for bringing the gap of the digital divide.

3. Discussion

Based on the knowledge of ICT adoption, the research results related to the quality of life after using ICT are explored in three sections in regard to their needs. Given that the older adults would like to live as independently as long as possible (Blaschke, Freddolino & Mullen, 2009), it is evident that they then also have the need to receive information (Godfrey & Johnson, 2009; Sum, Mathews, Pourghasem & Hughes, 2008). Furthermore, the need for emotional support is not always satisfied (Allaire, McLaughlin,Trujillo, Whitlock, LaPorte & Gandy, 2013; Lia Hern, Modesta, Beni & O Omez-Zú, 2009). Digital technology including ICT is constantly changing, which results in a variety of innovations and constant updates. The periods between releases of new operation systems are becoming shorter and shorter. For some of the older adults it is a challenge to gain some basic skills on the use of ICT facilities; the rapid changes in the operating systems are a burden. If the user does not frequently update their systems, the service providing companies might stop the support for the user's current operating system. It is not only the operating systems which need to be often updated, even the applications need to be updated regularly. Sometimes the changes in the applications may confuse the older adults if they do not have the opportunity to get support from friends or relatives. From this viewpoint, the sorts of devices which target older adults with the functions of reaching information and making communication should be widely promoted. These devices should be easy to operate, not expensive and portable. More importantly, these devices should be compatible with the devices which are used by the friends of the older adults to communicate with each other.

Ethical standards are indispensable in social work research and practice. However, the discussion of ethical issues related to the usage of ICT by older adults is missing in the data of the present study. Ethical challenges are addressed in other research (Reamer, 2013) from the point of view of online social work practice. Specific ethical issues should pay attention to the environment of ICT which advocate an open and sharing atmosphere. Due to the features of ICT, the ethical issues such as how to keep the privacy and confidentiality of service users need to be clarified to protect both service users and social workers. Recently, monitoring technologies are combined with the ICT innovations, but these kinds of monitoring results in a variety of ethical concerns including in relation to privacy. The researchers always claim they have ethical concerns during innovation, but a detailed discussion of monitoring technologies needs to be explored.

4. Conclusion and limitation

This research review of the English language research on older adults using ICT shows the following: the current knowledge of older adults' adoption of ICT, ICT innovation targets on older adults and the social services for support the using ICT of older adults. In this research a theoretical framework is built which maps out the social science theories that could be used by the researchers of social services in regard to the use of ICT by the elderly. Empowerment is much more predominant for research and practices in this field. According to Solomon (1976), empowerment is the guiding principle for service users to access resources. Empowerment does not attempt to drive the service users to the professional level nor direct them to the goal made and described independently by the social workers; instead, older adults who have the willingness to use ICT for daily life could find resources from the social services. Empowerment also takes the service users as subjects who have their own values, and as such the usage of ICT for getting in touch with families and friends may be seen as an implement of their social interaction to prevent loneliness and social isolation. Furthermore, these seniors could also be a resource for others seniors who wish to learn to use ICT. Hence, empowerment theory could be employed to support further research and practice.

The analysis of the data demonstrates that the usage of ICT for older adults can prevent their loneliness and social isolation. The results of the data analysis indicate that older adults have a positive attitude towards ICT and that they have the need to use ICT for both subjective and objective reasons. The lack of effective technical support stops them from using ICT, and they prefer to have a step-by-step process where they can gain the necessary skills and receive support from their peer group. ICT provides a supplement for the needs of older adults in their daily life. Due to the advantages of ICT, it offers elderly people an opportunity to talk anytime and anywhere. The users of ICT share health knowledge, rank local hospitals and doctors, search for companions for shopping and travelling and so on. However, the disadvantage of utilising ICT is the spread of negative sentiment: the lack of professional advice and the fact that most users have no skills for dealing with the negative sentiment of others and can only show their concern. Professional social workers, who often have not been invited to join the groups, should be involved in the groups as their help is especially needed in cases of emergency, such as when helping with suicidal thoughts. Research which focuses on rural residents is still underdeveloped. Houses in rural areas are decentralised, and the younger generations in the family have often moved out which results in the potential need of ICT among older adults. As such, research and the social services should pay more attention to older rural adults.

The usage of ICT could enhance the communication of older adults, and the social interaction could lead to a more active life. Based on the result of the data analysis of this study, the older adults should be encouraged to use ICT and related services are also needed. Although some research such as the disengagement theory (Cumming & Henry, 1961) claims it is natural and acceptable for older adults to withdraw from society. But the use of ICT may not only depend on the choice of the seniors themselves: the changeable society may also lead to different lifestyles for seniors. Research on this topic, with different results from different cultures and different genders, is not included in this study.

This is a context based literature review so far as it does not cover all countries and languages. As such, the conclusion from the data of this study may not be applicable for a global context. The language setting of the data collection limited the result of the literature search; for instance articles written in languages which have a large number of native speakers, for example Chinese, Arabic or Latin languages and so on, are not reviewed in the current study. For instance, taking the world's second large economy as an example, China has seen a rapid growth in digital development in the past decade and as such needs to be studied in the future in the context of this research. The use of ICT by the elderly is growing but has not yet been studied from the perspective of social services. Current researches indicate that the usage of ICT could improve the life quality of older adults by enhancing their social interaction and lessening their social isolation.

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