How can online communication enhance older adults’ social connectivity?
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Chapter 1. Introduction

This thesis investigates how online communication can enhance older adults’ social connectivity. In particular, it devotes attention to older laggards. Laggards are “the last in a social system to adopt an innovation” (Rogers, 2003, p. 284), which would include the last 16% of the population. In this thesis we address two main issues. First, older adults tend to be late adopters or laggards (Bucy, 2000; Carpenter & Buday, 2007; Cutler, Hendricks, & Gayer, 2003; Czaja, et al., 2006; Friedberg, 2003; Juznic, Blazic, Mercun, Plestenjak, & Majcenovic, 2006; Katz & Aspden, 1997; Kerschner & Chelsvig-Hart, 1984; McCloskey, 2006; Morrell, Mayhorn, & Bennett, 2000; Morris & Venkatesh, 2000; Morris, Goodman, & Brading, 2007; Peacock & Kunemund, 2007; Quinn, 2010; Schleife, 2006; Thayer & Ray, 2006). Therefore, we study how implementation of online communication tools among such older laggard populations can be achieved. Whereby online communication tools refer to Internet-based platforms or tools that enable interactive, synchronic, or asynchronic communication between individuals. Second, we debate the effect of online communication on older adults’ social connectivity once such communication has been adopted (Dickinson & Gregor, 2006; Nef, Ganea, Müri, & Mosimann, 2013; Sum, Mathews, Pourghasem, & Huges, 2008; Wagner, Hassanein, & Head, 2010a). Social connectivity is the “individual’s perception of the interpersonal relationships and social roles in their life” (WHOQOL group, 1995, p. 1405). Literature suggests that the way older laggards adopt online communication tools may affect the relationship between online communication and older laggards’ social connectivity (Brandtzæg, 2012; Karimi & Neustaedter, 2011; Paul & Stegbauer, 2005; Pfeil, Zaphiris, & Wilson, 2009; Sum et al., 2008; Vuori & Holmlund-Rytkönen, 2005). Therefore, we also explore individual adoption mechanisms and test adoption factors that influence the relationship between online communication and older laggards’ social connectivity over time.

We study both implementation and adoption processes to assess how online communication may change older laggards’ social connectivity. Both processes are related, yet not the same (Jhu et al., 2006). In this thesis, the implementation process concerns activities organized by an organizational unit (e.g., an implementation project)
to enable, promote, and manage online communication tool adoption among an older population. Implementation practices may, for example, include providing training, assisting the development of a user-oriented technology design, and integration of online communication within existing practices. The adoption process itself relates to the personal learning and experimentation process through which specific online communication patterns take shape. During their initial interactions with online communication tools, older laggards develop an understanding of what this tool is and how it can and should be used, informing emerging patterns of use. These initial interactions and sensemaking processes jointly constitute the adoption process.

The next sections sketch the socio-political debate that provided the empirical justification for this study. First, we describe reasons to enhance older adults’ social connectivity in the context of controlling rising healthcare costs. Then, we examine how the current literature is unclear regarding whether online communication tools enhance older adults’ social connectivity. Next, we formulate our research aim and questions, which relate to the implementation and adoption of online communication tools among older laggard populations. Finally, we present the thesis outline and main research contributions.

1.1. Population aging increases healthcare costs

Societies are aging worldwide. This phenomenon is new in the sense that it is “without parallel in human history,” it is pervasive and affecting all corners of the world, and it is enduring, which means that we will not return to pre-aging population compositions (United Nations, 2002). Aging is caused by 1) dropping fertility rates and 2) increased life expectancy, and became especially noticeable after 2010 when the “baby boom” generation began turning 65 (Anderson & Hussey, 2000). Aging has profound societal implications, one of which concerns increasing healthcare costs. For example, in Europe, the 15 countries that joined the European Union before 2004 (EU15) tend to spend less than 5% of their GDP per capita on healthcare among age cohorts under the age of 50. However, after citizens turn 60, their healthcare expenditures accelerate to approximately 20% GDP among the 90-94 age cohort (Przywara, 2010). Another illustrative study, based on US data, estimates that half an individual’s lifetime health expenditure occurs during the senior years (Alemayehu & Warner, 2004). As a result of aging, Martini, Garrett, Lindquist, &
Isham (2007) expected US per capita healthcare costs to increase by 18% between 2000-2050. Przywara (2010) found similar results for the EU15. Studies that closely examine the age-healthcare cost relationship show that age has a direct positive effect on long-term care costs, and an indirect positive effect on acute and informal healthcare costs through increased mortality risks and lower average health status (De Meijer et al., 2013). Consequently, because a significant share of the healthcare costs are mediated through health status and mortality, increasing healthy life expectancy has the potential of diminishing increases in health expenditure related to aging (Przywara, 2010).

1.2. Enhancing older adults’ social connectivity reduces healthcare needs

One way to extend healthy life expectancy is by enhancing older adults’ social connectivity. Such enhancement is an important research and policy topic not because older adults are lonelier than younger adults, which they do not seem to be (Pinquart & Sorensen, 2001; Dykstra, 2009; Dykstra, Van Tilburg, & De Jong Gierveld, 2005). Nor has older adult loneliness increased over the past decades (Victor et al., 2002; Dykstra, 2009). Instead, what makes older adults’ social connectivity an especially relevant research topic is its strong correlation with and impact on health and mortality. Scholars have found that social connectivity is positively linked to physical health (Berkman, Glass, Brissette, & Seeman, 2000; Fees, Martin, & Poon, 1999; Hawkley & Cacioppo, 2010), mental health (Berkman et al., 2000; Hawkley & Cacioppo, 2010), and health behavior (Berkman et al., 2000), and that it negatively affects mortality risks (Hawkley & Cacioppo, 2010; Holt-Lunsta, Smith, & Layton, 2010). Among older populations, both perceived and quantified forms of social connectivity are associated with higher levels of physical health (Cornwell & Waite, 2009). Perceived social connectivity is also related to better mental health (Cornwell & Waite, 2009; Luanaigh & Lawlor, 2008). Moreover, older adults’ social connectivity supports activities of daily living and reduces mortality risks in the next period (Perissinotto, Stijacic, Cenzer, & Covinsky, 2012). Based on these findings, scholars have suggested that interventions to enhance older adults’ social connectivity could enhance their health status (Cornwell & Waite, 2009; Luanaigh & Lawlor, 2008; Perissinotto et al., 2012), and thus increase their healthy life expectancy.
Mechanisms underlying the effects of social connectivity on health outcomes are not entirely clear (Hawkley & Cacioppo, 2010; Perissinotto et al., 2012). However, a lack of social connectivity seems to trigger a series of reactions resulting in diverse health behavioral and physiological outcomes (Berkman et al., 2000; Hawkley & Cacioppo, 2010). Berkman et al. (2000) argue that social network characteristics enable five psychosocial mechanisms: provision of social support, social influence, social engagement and attachment, access to resources and material goods, and person to person contact enabling the transmission of infectious deceases. These mechanisms in turn shape health behavior and physiological pathways. Hawkley and Cacioppo (2010) provide an extensive review of the literature and conclude that loneliness (i.e., a lack of social connectivity) stimulates vigilance for threat and feelings of vulnerability. As a result lonely persons experience social situations as more threatening than non-lonely persons. Moreover, they expect and remember more negative social interactions. As a consequence, lonely persons experience increased hostility, stress, pessimism, anxiety and low self-esteem. Loneliness negatively affects health behaviors, because it diminishes the ability for self-control of not only emotional reactions, but also performing physical activity, alcohol intake and eating habits. Moreover, loneliness negatively affects sleep quality, leading to reduced day time functioning, which in turn further increases loneliness. Finally, loneliness is found to be positively related to total peripheral resistance (TPR), a key indicator for blood pressure and, therefore, a risk factor for cardiovascular disease (Hawkley & Cacioppo, 2010). Although the underlying mechanisms are subject to debate, the studies of Berkman et al. (2000) and Hawkley and Cacioppo (2010) provide persuasive arguments to explain the positive social connectivity-health relationship.

1.3. Online communication and older laggards’ social connectivity

Inspired by the increasing popularity of online communication (Facebook, 2013; Internet World Stats, 2014; Radicati, 2013), researchers and policy makers have argued that online communication may have the potential of enhancing older adults’ social connectivity (Ambient Assisted Living Joint Program, 2012; Cody, Dunn, Hoppin, & Wendt, 1999; Dillon, 2003; Erickson, 2011; Opalinski, 2001; Shapira, Barak, & Gal, 2007; Saunders, 2004; Sokoler & Svensson, 2007; Tsai & Chang, 2009; Waycott et al., 2013; White et al., 2002). It has been suggested that older adults’ social connectivity could be stimulated by the use of, for example, social network sites (Dil-
online communication tools especially developed for older adults (Sokoler & Svensson, 2007; Tsai & Chang, 2009; Waycott et al., 2013), and attending computer courses (Cody et al., 1999; Shapira et al., 2007; White et al., 2002).

Nevertheless, it is not at all certain that online communication does actually enhance older adults' social connectivity. In fact, two issues brought forward in the literature may limit this effect. First, age negatively influences adoption of online communication tools (Bucy, 2000; Carpenter & Buday, 2007; Cutler et al., 2003; Czaja et al., 2006; Friedberg, 2003; Juznic et al., 2006; Katz & Aspden, 1997; Kerschner & Chelsvig-Hart, 1984; McCloskey, 2006; Morrell et al., 2000; Morris & Venkatesh, 2000; Morris et al., 2007; Peacock & Kunemund, 2007; Quinn, 2010; Schleife, 2006; Thayer & Ray, 2006). This negative relationship indicates an implementation problem: how can we implement online communication tools among older populations that are often hesitant to adopt such tools? Second, evidence on the effect of online communication on older adults' social connectivity is inconclusive (Dickinson & Gregor, 2006; Nef et al., 2013; Sum et al., 2008; Wagner et al., 2010a). This poses an adoption problem: better understanding of the causal relationship between online communication and social connectivity requires closer investigation of the adoption process that shapes online communication behavior. The next two sections elaborate on these two problems and suggest ways to address them.

1.3.1. Implementation knowledge gap: managing IS implementation among older laggard populations

Previous research has shown repeatedly that older adults are, on average, late to adopt new technologies, including online communication tools. For example, in 2013, only 46% of the world’s older Internet users were active on social network sites (SNS) compared to 90% of those aged 18-29 (Smith, 2014). Considering the prevalence of lagged adoption patterns among older populations over time (e.g., Kerschner & Chelsvig-Hart, 1984), space (China Internet Network Information Center, 2014; Seybert & Reinecke, 2013; Haight, Quan-Haase, & Corbett, 2014; Smith, 2014), and technologies that include, but are not limited to, the Internet, email, and social networking sites (China Internet Network Information Center, 2014; Seybert & Reinecke, 2013; Haight et al., 2014; Johnson, 2012; Karahasanović et al., 2009;
Smith, 2014; Zickuhr & Madden, 2012), it seems unlikely that these lagged adoption patterns are of a temporal nature (Wandke, Sengpiel, & Sönksen, 2012; Charness & Boot, 2009; Hanson, 2009). Although there is increased attention for age related adoption effects (Niehaves & Plattfaut, 2014; Tams, Grover, & Thatcher, 2014), the Information Systems (IS) literature has yet to explain why and how age matters to technology adoption (Tams et al., 2014). Evidence suggests that the effect is related to cognitive, sensorimotor, personality, and IT culture changes related to aging (Tams et al., 2014). For example, declining physical capabilities associated with old age, such as reduced vision (Carpenter & Buday, 2007; Chou, Lai, & Liu, 2010; 2013; Czaja et al., 2006; Saunders, 2004) and hand operation (Carpenter & Buday, 2007; Chou et al., 2010; 2013; Saunders, 2004), in addition to loss of cognitive abilities, e.g., memory loss (Chou et al., 2013; Czaja et al., 2006; Lee, Chen, & Hewitt, 2011; Wolfson, Cavanagh, & Kraiger, 2014), may explain the persistence of these patterns. These observations suggest that older adults are more prone to becoming online communication laggards (Rogers, 2003) now and in the future.

Age-based inequalities in adoption patterns are cause for concern. They may inconvenience older laggards, when online communication tools can provide a higher service level than offline forms of communication. Moreover, online communication patterns may replace offline communication patterns (Hage and Noseleit, 2015), excluding older laggards form communication. In particular, inequalities in age-based adoption patterns may reduce the ability of online communication to enhance older adults’ social connectivity. Without targeted interventions, the diffusion of online communication is likely to reinforce, rather than change, systematic inequalities in these adoption patterns (Hage, Roo, Van Offenbeek, & Boonstra, 2013, included as Chapter 2 in this thesis), for example, by further increasing the digital inequality (Hanson, 2010; Hargittai, 2007) and social exclusion of older laggards (Lüders & Brandtzæg, forthcoming; Rogers, 2003; Selwyn, Gorard, Furlong, & Madden, 2003). In this light, managing targeted interventions to implement online communication tools among laggard older populations is challenging. If we aim to enhance older adults’ social connectivity, and therefore, healthy life expectancy, by means of online communication technologies, it is vital to better understand how online communication implementation projects among laggard populations can be successful, and how
to manage local change outcomes. This is the first knowledge gap addressed in this study.

1.3.2. Adoption knowledge gap: adoption factors and mechanisms shaping changes in older laggards’ social connectivity

In the literature, the effect of online communication on older adults’ social connectivity is debated (Dickinson & Gregor, 2006; Nef et al., 2013; Sum et al., 2008; Wagner et al., 2010a). Empirical studies show a positive, negative, or no relationship between online communication and older adults’ social connectivity. In addition to methodological issues, conflicting findings can be contributed to the factors and mechanisms that influence the relationship between social connectivity and online communication, such as the type of online communication (Karimi & Neustaedter, 2011; Pfeil et al., 2009; Sum et al., 2008), type of social connectivity (Sum et al., 2008), and personal characteristics (Brandtzæg, 2012; Paul & Stegbauer, 2005; Vuori & Holmlund-Rytkönen, 2005).

The observation that the effect of online communication on older adults’ social connectivity may depend on technological, social and personal characteristics is thought provoking. It suggests that successful adoption may not simply be a matter of older adults using online communication tools. Instead, success would depend on the combination of technological, social, and personal characteristics that jointly lead to particular outcomes. The issue is then how an efficacious pattern of these characteristics takes shape during the adoption of online communication tools. This is the second knowledge gap addressed in this study.

1.4. Research questions and contributions

At this point, we have identified two knowledge gaps in the literature. At the project level, it is unclear how to manage online communication tool implementation targeting older laggard populations, to achieve the desired local change. At the individual level, the effect of online communication on older laggards’ social connectivity is ambiguous and could be influenced by a variety of technological, social, and personal characteristics. This thesis aims to better understand how online communication can enhance older laggards’ social connectivity by addressing these two issues with the following questions (Q), respectively:
Q1. *How can the implementation of online communication tools among older laggard populations be managed in such a way that implementation results in the desired local change?*

Q2. *How do adoption factors and mechanisms shape the effect of online communication on older laggards’ social connectivity?*

Figure 1.1. depicts the research domain addressed by this thesis. The questions are positioned within this domain, whereby the first question addresses the implementation process. The second question relates to the process through which older laggards adopt online communication tools that result in changes to their social connectivity.

This thesis makes two main contributions to the literature. The first contribution is made to the IS structuration literature; the second feeds back to the literature that studies the effect of online communication on older adults’ social connectivity. The next sections elaborate on these research contributions.

![Figure 1.1. Research domain and positioning of questions (Q)](image)

Figure 1.1. *Research domain and positioning of questions (Q)*

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1 The figure is based on structuration theory (Giddens, 1984) enriched with socio-material principles (Law, 1992; Latour, 2005). For an extensive discussion of the figure’s core concepts, see Chapter 3.
1.4.1. Including the implementation phase in IS structuration literature

Answering the first question posed in this thesis contributes to IS structuration literature (based on Giddens, 1984) by making the role of the technological artifact more explicit (Orlikowski & Iacono, 2001), and particularizing the theory to the context of multiple site\textsuperscript{2} implementation projects. We do so by extending the duration of the analysis to include implementation in addition to the adoption phase, and address multiple levels of analysis as suggested by Leonardi and Barley (2010). Specifying the role of technological artifacts within multi-site implementation projects provides better insight into the interactions between project management and local change recipients, as well as the social and technological changes that result from these interactions (Lyytinen & Newman, 2015; Leonardi, 2009; Leonardi & Barley, 2010; Williams & Pollock, 2012). This allows such change to be managed.

The first contribution is made by two studies that focus on the project level presented in Chapters 2 and 3. Chapter 2 analyzes the results of the systematic literature review of implementation factors that influence local IS adoption. Because successful IS implementation in organizations has proven difficult (Boonstra & Van Offenbeek, 2010; Cooper & Zmud, 1990; Tait & Vessey, 1988), this review considers whether this applies to rural, local communities. Following the strategic change model of Pettigrew and Whipp (1991), we identify context, process, and content factors and their possible interactions. The aim of this review is to contribute to our understanding of the implementation factors that determine successful IS adoption in local communities.

Chapter 3 extends the analysis presented in Chapter 2 with an embedded case study of a multi-site IS implementation project. It assesses when, i.e., through which mechanisms, multi-site IS implementation projects contribute to IS-enabled local change. The particularly difficult part in these implementation projects often is managing the integration of IS at multiple local sites (E.L. Wagner, Newell, & Piccoli, 2010b; Leonardi & Barley, 2008; Sia & Soh, 2007; Lucas, Walton, & Ginzberg, 1988), thereby enabling local change. This chapter aims to enhance our understanding of the bridging mechanisms underlying IS-enabled change in multi-site imple-\textsuperscript{2} From here on referred to as multi-site implementation projects.
mentation projects, and to explore opportunities for intentionally shaping such change with the help of these bridging mechanisms.

1.4.2. Reducing ambiguity surrounding the relationship between online communication and older laggards’ social connectivity

Findings related to the second question contribute to the literature by reducing ambiguity related to the inconsistent findings in the literature on the effect of online communication on older laggards' social connectivity (Dickinson & Gregor, 2006; Nef et al., 2013; Sum et al., 2008; Wagner et al., 2010a).

This contribution is made in Chapters 4 and 5 through studies conducted at the individual level. Chapter 4 offers an alternative perspective on older laggards’ adoption through an interpretive multiple case study of how the adoption process of online communication tools changes the social connectivity felt by older laggards. Scholars have argued that the adoption process should be viewed as a socio-technical change process that consists of recurrent, socially meaningful actions (Orlikowski, 1996; 2000) conducted by social actors (Lamb & Kling, 2003). However, such conceptualizations have seldom been applied in the literature regarding online communication effects on older adults’ social connectivity. Our interpretive analysis of the socio-technical adoption process among older laggards brings to the fore three interrelated adoption mechanisms, as well as five themes that describe how these mechanisms shape older laggards’ social connectivity. This study contributes by identifying adoption mechanisms that characterize older adults’ adoption as a socio-technical process, and thereby extends the analysis of older adults’ adoption beyond the individual adoption decision or behavioral intent, which are well studied in older populations (e.g., Braun, 2013; Chung, Park, Wang, Fulk, & McLaughlin, 2010; Maier, Laumer, & Eckhardt, 2011; McCloskey, 2006; Morris, Venkatesh, & Ackerman, 2005; Pan & Jordan-Marsh, 2010). Moreover, the study finds empirical proof for interrelationships between adoption mechanisms, as suggested theoretically by Thompson (2012). Finally, it focuses explicitly on older laggards as an understudied research population (Xie, 2008a).

Chapter 5 is an impact study that asks whether online communication enhances the social connectivity of an aging population. By analyzing panel data, the study enriches the literature, first, by focusing on older adults as an understudied research
population with regard to the impact of online communication (Xie, 2008a). More importantly, it starts to disentangle the factors that may explain the conflicting results reported in the literature by developing and testing four hypotheses related to Who uses What, How, and with Whom. Finally, the study takes steps toward assessing the debatable causal direction of online communication-social connectivity relationship (see also Agarwal, Animesh, & Prasad, 2009; Chen, 2013; Ward, 2012).

1.5. Research context and focus

The research presented in this thesis is based on an embedded case study of an implementation project, the “Verzoamelstee,” that implemented online communication tools among older laggard populations in three rural villages (population <600). The Verzoamelstee, including the PhD project, was a joint initiative of the University of Groningen, the University Medical Center Groningen, three local municipalities, patient association “Zorgbelang,” older adult association “Overleg Samenwerkende Ouderenbonden,” the association for Groninger villages (Vereniging Groninger Dorpen), and the association for Groninger municipalities (Vereniging Groninger Gemeenten). The project was funded by the National Care for the Elderly Programme (NPO), the province of Groningen, the region Groningen-Assen, and health care insurer Menzis. Data collection took place over a 3.5-year period, from February 2010 to June 2014, and covered the entire lifespan of the project. During that period, nearly all formal project meetings were attended, in addition to a large number of local project events in all three participating villages. In total, 338 older adults participated in the research through surveys, tablet diaries, interviews, participant observations, and/or focus groups. Moreover, approximately 35 local volunteers assisted during data collection, whereas other villagers allowed for, enabled, or even arranged meetings between the researcher and (potential) participants (see also Acknowledgements).

This thesis focuses on older laggards. Rogers (2003) considered laggards to be the most localized of the adoption categories, typically holding on to traditional values. We define older adults as those aged 65 and above (Lüders & Brandtzæg, forthcoming)³.

³ An exception was made for a tablet course participant who was 60+, but not yet 65 at the time of data collection.
In our study, we focus on rural communities. A community is considered to be rural when it is located in a geographical area with low population density, limited resource bases, relative isolation, and cultural or ethnic homogeneity (Galbraith, 2008). Rural communities are especially affected by aging because of an overall out-migration of working-age adults to urban areas, and the in-migration of former urban dwellers, often at retirement age (Fésüs, Rillaers, Poelman, Gáková, 2008; Labrianidis, 2004; United Nations, 2009). Moreover, service levels in rural communities have declined considerably during the past decades. With the disappearance of local services, such as the café and community grocer, traditional opportunities for local social interactions in these already relatively isolated communities have been further reduced. The combination of these characteristics makes rural communities a particularly appropriate and important research context when studying older laggards’ social connectivity. Not only is the share of older adults relatively high in these settings, but declining service levels also put pressure on older adults’ social connectivity, thus creating a need for alternative ways to interact and meet each other. In summary, if online communication can enhance older laggards’ social connectivity, it seems that it should come to the fore in rural communities.

Our key constructs are defined as follows. Online communication relates to interactive, synchronous, or asynchronous communication between individuals mediated through Internet-based platforms or tools. Interactive online communication involves the “reciprocal exchange of messages” (Emanuel et al., 2008, p. 25). It is, therefore, distinct from expressive communication, e.g., merely sending messages, and receptive communication, e.g., only receiving messages (Emanuel et al., 2008). However, interactive online communication does not require immediate reaction, and therefore, it can be synchronous as well as asynchronous. For example, exchanging emails or liking a picture posted by a friend on Facebook are interactive forms of communication, whereas reading a web page is an example of receptive communication.

Social connectivity is a well recognized Quality of Life aspect (Skevington, Lotfy, & O’Connell, 2004), and refers to an “individual’s perception of the interpersonal relationships and social roles in their life” (WHOQOL group, 1995, p. 1405).
1.6. Thesis outline

The next four chapters present the research findings of this PhD study. Chapters 2 and 3 focus on the project level. Chapter 2 provides a general overview of e-Health implementation factors in rural settings, and should be of importance to a broad audience interested in rural IS implementation. Chapter 3 focuses on the management of local change outcomes through interactions and shifts between project and local actors. The managerial implications, summarized as three bridging tactics for managing local change, may be of particular interest to project managers. In Chapters 4 and 5, we focus on the mechanisms that underlie the individual level adoption process (Chapter 4), and measure the overall effect of online communication on social connectivity (Chapter 5). The results of these two chapters are intended to inspire future research on the conditions and mechanisms under which online communication can and cannot enhance older laggards’ social connectivity. Moreover, the findings have important policy implications, which are discussed.

In the final, discussion chapter we return to our overarching research question and discuss insights derived from our research endeavor on how online communication can enhance older laggards’ social connectivity. The discussion combines the findings from the project level studies conducted in Chapters 2 and 3. Similarly, we highlight the linkages between the two individual level studies presented in Chapters 4 and 5, and reflect on the implications of these findings for the implementation process addressed in Chapters 2 and 3.