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Social Networks im Zeitalter des demographischen Wandels: Senioren als „Digital Immigrants" in virtuellen Umgebungen

vorgelegt von
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Vor der eigentlichen Arbeit möchte ich noch ein paar Worte denen Personen widmen, die mich bei der Entstehung dieser Arbeit unterstützt haben:

Wer schon einmal eine Dissertation verfasst hat, der weiß, wie schwer mitweilen die Entstehung sein kann. Das ändert sich im Übrigen auch nicht bei Folgedissertationen. Im Gegenteil – denn mit wachsender Erfahrung steigen auch die eigenen Ansprüche und die kritische Haltung gegenüber den Resultaten.

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Abbildungsverzeichnis[1]

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[1] Wichtig: Das Abbildungsverzeichnis beinhaltet die Referenzen des Rahmenwerkes. Um die Authentizität der Artikel nicht zu verletzen, sind diese in Originalfassung (inklusive originaler Abbildungsaufzählungen und Referenzen) verwendet worden.

Tabellenverzeichnis[2]

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[2] Wichtig: Das Tabellenverzeichnis beinhaltet die Referenzen des Rahmenwerkes. Um die Authentizität der Artikel nicht zu verletzen, sind diese in Originalfassung (inklusive originaler Tabellenaufzählung und Referenzen) verwendet worden.

Abkürzungsverzeichnis und Glossar

Abkürzung	Beschreibung
AAL	Ambient Assistant Living, Definition "*AAL cannot be seen as a single technology but as a network of interacting systems or agents, for instance companies from different areas of society. The aim of AAL is to combine those various agents in one holistic system adapted to diverse customer needs*" (Giesecke et al., 2005, S.2-3)
(A)ADL	Assistance in Activities of Daily Living, beschreibt alle Assistenztätigkeiten bei Aktivitäten des Seniorenalltags
AT	Assistive Technology, generell Technologie zur Unterstützung von Senioren im Alltag
Content Management System	Ein Content-Management-System (oder Inhaltsverwaltungssystem) ist eine Software bzw. ein Rahmenwerk zur gemeinschaftlichen Erstellung, Bearbeitung, Pflege und Organisation von Inhalten in Webseiten (Details Krüger, 2010, S.125 ff.)
Demographischer Wandel	Beschreibt den allgemeinen Trend des steigenden Durchschnittsalters in der Bevölkerung (Details in Statistisches Bundesamt, 2011)
Digital Divide	Referenz für die Ursache einer Existenz von Digital "Immigrants" und Digital "Natives", Einteilung in einen Digital Divide ersten Levels (Ungleichverteilung des Internetzugangs) und eines zweiten Levels (Ungleichverteilung der Nutzungskompetenzen im Umgang)
Digital Immigrants	Gegenteil von Digital Natives, Personen, die nicht nativ mit den technologischen Umgebungen und virtuellen Möglichkeiten aufgewachsen sind und diese deshalb adaptieren müssen. (vergleiche Prensky, 2001)
Digital Natives	Definition Digital Natives: "*Our students changed radically. Today's students are no longer the people our educational system was designed for. […] Computer games, email, the Internet, cell phones and instant messaging are integral parts of their lives. [...] it is very likely that our students' brains have physically changed - and are different from ours - as a result of how they grow up.*" (Prensky, 2001, S.23)
Senioren	Definition "*There is no United Nations standard numerical criterion, but the UN agreed cutoff is 60+ years to refer to the older population*" (WHO, 2011)
SNS	Social Network Sites, Definition: "*web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system*" (Boyd & Ellison, 2007, S.90)
Social Media	Definition: "*A group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content*" (Haenlein & Kaplan, 2010, S.12)
UNDESA	United Nations Department of Economic and Social Affairs
Vertrauen	Definition: "*Uncertainty, vulnerability and the possibility of avoiding risk or of making a choice based on judgment, are seen as necessary conditions for the existence of trust*" (Blomqvist, 1997, S.272)
Virtuelle Umgebung	Definition: „*The term virtual environment is often used as a synonym for both virtual reality and virtual world. However, use of the term virtual environment actually predates the phrase virtual reality. Virtual environment is ambiguous in that it can be defined as a virtual world or as a world presented in a particular virtual reality hardware configuration.*" (Sherman & Craig, 2003, S.16-17)

Erklärung gemäß § 8 Abs. 1 Buchst. b) und c) der Promotionsordnung der Fakultät für Verhaltens- und Empirische Kulturwissenschaften

Promotionsausschuss der Fakultät für Verhaltens- und Empirische Kulturwissenschaften der Ruprecht-Karls-Universität Heidelberg
Doctoral Committee of the Faculty of Behavioural and Cultural Studies, of Heidelberg University

Erklärung gemäß § 8 Abs. 1 Buchst. b) der Promotionsordnung der Universität Heidelberg für die Fakultät für Verhaltens- und Empirische Kulturwissenschaften
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Ich erkläre, dass ich die vorgelegte Dissertation selbstständig angefertigt, nur die angegebenen Hilfsmittel benutzt und die Zitate gekennzeichnet habe.
I declare that I have made the submitted dissertation independently, using only the specified tools and have correctly marked all quotations.

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Ich erkläre, dass ich die vorgelegte Dissertation in dieser oder einer anderen Form nicht anderweitig als Prüfungsarbeit verwendet oder einer anderen Fakultät als Dissertation vorgelegt habe.
I declare that I did not use the submitted dissertation in this or any other form as an examination paper until now and that I did not submit it in another faculty.

Vorname Nachname
First name Family name   _____ (Tobias Fritsch)

Datum, Unterschrift
Date, Signature   _____

1. Einleitung

Mit der (Weiter-)Entwicklung des Internets und den daraus entstehenden Anwendungen, wie Social Network Sites (SNS) verändert sich die zwischenmenschliche Kommunikation signifikant[3]. Insbesondere jüngere Personen, die im digitalen Zeitalter aufgewachsen sind, sogenannte „Digital Natives"[4], zeigen Veränderungen im Umgang mit ihrer Umwelt (Kommunikationshäufigkeit, Art der Kommunikation, Darstellung des sozialen Netzwerkes).

Zusätzlich herrscht in vielen entwickelten Staaten ein fundamentaler demographischer Wandel, welcher in einer zunehmenden Alterung der Bevölkerung und einem Anstieg der Anzahl an Senioren einhergeht. Im Gegensatz zu den Digital Natives sind diese „Digital Immigrants" nicht mit virtuellen Umgebungen aufgewachsen, sondern adaptieren diese und versuchen sich den verändernden Umständen nach und nach anzupassen. Aufgrund der aktuellen Forschungsausrichtung[5] fällt die Gruppe der Senioren bei der Betrachtung von virtuellen Umgebungen allerdings oft aus dem Fokus, folglich sind ihre Präferenzen bezüglich sozialen Netzwerken und ihre Interaktionsgewohnheiten weniger detailliert ergründet.

Die vorliegende Arbeit setzt genau an diesem Spannungsfeld an.

1.1. Abstrakt

Thema: Diese Dissertation thematisiert den Umgang von Senioren mit virtuellen Umgebungen. Insbesondere liegt der Betrachtungsfokus auf Social Network Sites (SNSs), allerdings werden andere virtuelle Umgebungen nicht ausgeschlossen. Diese Betrachtung geschieht unter der Berücksichtigung zweier aktueller Trends. Das so entstehende Spannungsfeld zwischen der steigenden Interaktion in diesen virtuellen Netzwerken generell und einem demographischen Wandel hin zur gesellschaftlichen Alterung umfasst die Haupteinflüsse für die Themenstellung.

Gegenstand der Analyse dieser Arbeit ist, wie Senioren den Umgang mit den virtuellen Umgebungen erlernen können. Dies setzt am eingangs beschriebenen Unterschied zwischen „Digital Natives" und „Digital Immigrants" (zu denen auch die Senioren gehören) an, den sogenannten „Digital Divide". Um die Kluft in der Fähigkeit des Umgangs mit diesen Umgebungen zu überwinden, hilft ein Verständnis über die Lernansätze der Senioren bei einem effizienteren Design der virtuellen Umgebungen (wie z.B. SNS). Zur Analyse der Lernansätze wird exemplarisch die Lerntheorie des Lerndreiecks von Knud Illeris als Erklärungshilfe herangezogen.

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[3] Für Details hierfür siehe Kapitel 2.1 für Referenzen zu Hintergrundinformationen.

[4] Wesentliche Begriffe werden im Glossar und in Kapitel 2.1 definiert/thematisiert.

[5] Siehe hierfür im Detail die Resultate der Metaanalyse (Literaturreview), welches in Kapitel 3.2 thematisiert wird.

Ansatz: Im Kontext dieser Themenstellung sichtet die Arbeit zunächst die bestehende Forschungsliteratur, welche sich mit dem Verhalten von Senioren in virtuellen Umgebungen beschäftigt. Dies geschieht durch eine strukturierte Metaanalyse, bei der aus mehr als 4800 potentiellen Resultaten[6] insgesamt 27 wissenschaftliche Artikel identifiziert wurden, die sich mit dieser Themenstellung auseinandersetzen. Auf Grundlage der methodischen und Inhaltlichen Analyse wird der aktuelle Stand der Forschung dokumentiert und bestehende Lücken identifiziert.

Darauf aufbauend beschreiben zwei semi-strukturierte Befragungen inklusive statistischer Auswertung den aktuellen Stand der Kommunikation von Senioren in digitalen Umgebungen. Hierbei liegt ein Fokus der Befragung auf der potentiellen Nutzung von virtuellen Umgebungen bei der Kommunikation. Hierbei greifen die Befragungen Handlungsmotivationen der Befragungsteilnehmer auf. Insgesamt wurden dabei Personen im Alter zwischen 60 und 90 Jahren in zwei separaten Studien[7] befragt.

Komplementär zu den Befragungen wird in einer weiteren Befragung mit 77 Teilnehmern zwischen 50 und 81 Jahren auf einem Szenarium basierten Vergleich[8] eingegangen. Dabei wird zum einen der potentielle Einfluss von Vertrauen auf die Handlungsmotivationen und zum anderen die Attraktivität zwischen verschiedenen virtuellen Umgebungen aus Perspektive der Senioren verglichen. Hierbei werden 8 verschiedene Szenarien, angefangen von Ambient Assistant Living bis hin zu Social Media Networks, gegeneinander verglichen und die relative Präferenzstruktur der Senioren bezüglich dieser Wahlalternativen analysiert.

Auf Grundlage dieser Erkenntnisse dienen darauf folgende Experteninterviews und eine Metaanalyse der aktuellen SNS zur Feststellung der effektiven Nutzung von virtuellen Umgebungen durch Senioren. Hierfür dienen zunächst acht Experteninterviews[9] zur Einschätzung der Fähigkeit aktueller Umgebungen um auf die Bedürfnisse der Senioren effektiv einzugehen. Die anschließende Analyse der Social Media Networks bewertet die Fähigkeiten dieser virtuellen Umgebungen auf diese Bedürfnisse real einzugehen. Zur Messung[10] wird hierfür ein Kriterienkatalog von 26 prädeterminierten Attributen verwendet, wogegen die realen Webpages verglichen werden. Diese Ansätze stellen eine indirekte Analyse von realem Handeln der Senioren dar.

Zuletzt beinhaltet die Analyse ein kontrolliertes Experiment[11], in dem die Auswirkungen auf Lernverhalten von Senioren und deren Umgang mit virtuellen Umgebungen direkt beobachtet wird. Als Behandlung im Experiment dient hier ein unterschiedliches Level an praktischer

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[6] Details der Suchanfrage, Parameter und Selektionen sind in Kapitel 3.2 innerhalb der Veröffentlichung enthalten.

[7] Die Details der Befragungen und die Analyse der Resultate werden in Kapitel 3.3 thematisiert.

[8] Eine weitere Vertiefung zu den Szenarien basierten Vergleich ist in Kapitel 3.4 enthalten.

[9] Inhalte der Experteninterviews und deren Auswertung sind in Kapitel 3.5 enthalten.

[10] Siehe hierfür auch Kapitel 3.6 zur Messung der Social Media Networks und deren Erfüllung des Kriterienkataloges.

[11] Die Details des kontrollierten Experimentes beinhaltet Kapitel 3.7.

Einbindung und verschiedene Hilfeleistungen (technische Assistenz gegenüber persönlichem, virtuellem Support). Auf Grundlage dieser Teilgruppen wird der Unterschied auf die subjektive Nützlichkeit und effektives Verhalten in den virtuellen Umgebungen gemessen.

1.2. Wissenschaftlicher Mehrwert

Problemstellung und Motivation: Durch die Erweiterung des Internets auf viele Lebensbereiche des Alltags hat sich in den letzten Jahren eine Veränderung im Umgang mit den virtuellen Umgebungen ergeben. Ein exemplarisches Beispiel dieses Wandels stellt dabei die Nutzung von SNS dar, welche Nutzer innerhalb einer virtuellen Gesellschaft miteinander verbinden. Sowohl die Anzahl der verfügbaren Webpages als auch die Anzahl der Nutzer steigen dabei zunehmend[12].

Dabei zeigt sich ein Generationsunterschied zwischen Personen, die mit den elektronischen Möglichkeiten von Computern und deren Vernetzung aufgewachsen sind (Digital Natives) und Personen, die diese Möglichkeiten adaptieren müssen (Digital Immigrants). Der dabei entstehende „Digital Divide" prägt die Nutzer in den virtuellen Umgebungen und führt in der Konsequenz zu einer zunehmenden Ausrichtung der Netzinhalte an die Personengruppe der Digital Natives.

Das als Resultat der Inhaltsausrichtung entstehende Problem einer indirekten Ausgrenzung von Digital Immigrants (durch fehlende Berücksichtigung ihrer Bedürfnisse) lässt eine Kluft entstehen, bei dem diese Teile der Gesellschaft an wichtigen Interaktionen wenig oder keinen Anteil mehr besitzen.

Leitfrage: Die Leitfrage dieser Arbeit thematisiert deshalb „*inwiefern können Senioren als Repräsentanten der Digital Immigrants effizienter in die Interaktion in virtuellen Umgebungen eingebunden werden?*"

Eine notwendige Voraussetzung zur Lösung der Leitfrage stellt dabei ein dediziertes Verständnis der aktuellen Situation dar. Ferner müssen Handlungsmotivationen von Senioren in virtuellen Umgebungen besser verstanden werden und letztlich anhand konkreter Beispiele evaluiert werden, ob reales Handeln und Entscheidungen mit den angegebenen Motivationen übereinstimmen.

Ein enger thematischer Zusammenhang besteht dabei in der Verknüpfung mit Lerntheorien. Denn bereits in der Problemstellung differenzieren sich die Teilgruppen der Digital Natives und der Digital Immigrants durch einen Informationsunterschied in der Nutzung von elektronischen Medien. So stellt eine Reduktion dieser Informationsasymmetrie eine zwingende Voraussetzung für die intensivere Integration älterer Personen in virtuelle Umgebungen dar. Folglich müssen die Ergebnisse in der Analyse vor allem unter dem Aspekt einer lerntheoretischen Betrachtung abgewogen werden.

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[12] Siehe hierzu zum einen die Nutzungshäufigkeit des Internets in den letzten 15 Jahren (BBC, 2013) und zum anderen Verteilung der Nutzung im Internet unter (BBC, 2013a). Hierbei ist eine deutliche Zunahme der Nutzung von Social Networks über die letzten Jahre zu erkennen. Exemplarisch kann der Marktführer Facebook (Facebook, 2013) und dessen Nutzerzahlen als Indikation für einen stetigen Zuwachs an der Gesamtanzahl der Nutzer dienen.

Wissenschaftlicher Mehrwert: Obwohl das Thema von Senioren in virtuellen Umgebungen angesichts der wachsenden Bedeutung des Internets und der steigenden Anzahl an älteren Personen zunehmende Relevanz erfährt, besteht in der bisherigen Forschung diesbezüglich ein Defizit in den gesammelten Erkenntnissen. Dieses vermutete Defizit wird innerhalb der Metaanalyse bestehender Forschungsliteratur (Kapitel 3.2) bestätigt.

Ausgehend von der Existenz eines solchen Defizits trägt die vorliegende Arbeit in folgenden Feldern dazu bei, wissenschaftliche Mehrwerte zu generieren:

a) Analyse der aktuellen Handlungsmotivationen von Senioren bezogen auf verschiedenste Aspekte von virtuellen Umgebungen. Die so ausgewerteten Fragebögen präzisieren das aktuelle Bild über die selbstgeäußerten Bedürfnisse von Senioren im Internet.

b) Eine Abwägung gegenüber verschiedenen Handlungsoptionen und deren relativer Wichtigkeit. Ein auf Szenarien basierender Vergleich setzt verschiedene Handlungsoptionen in Relation zu einander. Hiermit schärft sich das Verständnis für die Bedürfnisse der Senioren weiter. Außerdem beinhalten diese Szenarien unterschiedliche Technologien, welches einen Rückschluss auf die Präferenzen gegenüber den Nutzerschnittstellen gibt.

c) Mit dem Fokus auf die Tauglichkeit von aktuellen SNS, dienen Experteninterviews und eine nach strukturiertem Kriterienkatalog geführte Analyse zur Präzisierung in der Bestandsaufnahme des aktuellen Angebots. Die vorherigen Punkte fokussierten sich auf die Nachfrageseite, während dieser Teil die Angebotsseite gegenüberstellt.

d) Letztlich schafft die Arbeit mithilfe eines Experimentaufbaus Einsichten bezüglich der Lernfähigkeiten von Senioren. Dieser Teil zielt auf die Überbrückung des Digital Divides ab und vergleicht exemplarisch Strategien zur Lernhilfe für Senioren in virtuellen Umgebungen.

e) Im Rahmenwerk werden die skizzierten wissenschaftlichen Mehrwerte außerdem in den Kontext der bestehenden Lerntheorien gesetzt und exemplarisch anhand zweier ausgewählter Theorien analysiert. Dies dient zum einen dazu, den Erklärungsgehalt der Lerntheorien an einem konkreten Beispiel darzustellen, zum anderen der kritischen Reflektion für weitere Ansätze bei den Lerntätigkeiten der Senioren.

1.3.   Aufbau der Arbeit

Die verbleibende Arbeit baut sich dabei wie folgt auf:

Kapitel 2 beinhaltet die Darstellung des Forschungsrahmenwerkes. Zunächst werden dafür die wichtigsten Begriffe detailliert und mit der Leitfrage der Arbeit in Verbindung gebracht. Diese Detaillierung beinhaltet unter anderem den Kontext, in welchem die Begriffe innerhalb der Arbeit verwendet werden. Danach wird das potentielle Erklärungsmodell für das Lernverhalten von Knud Illeris kurz skizziert und eine Begründung für dessen Wahl (inklusive

Abgrenzung gegenüber anderen Möglichkeiten) gegeben. Darauf aufbauend beschreibt das Kapitel die aktuelle Themenmotivation und die wissenschaftlichen Mehrwerte, die durch die Beantwortung der Forschungsleitfrage erreicht werden können.

Kapitel 3 besteht aus einer Zusammenfassung der wissenschaftlichen Publikationen zum Thema. Diese werden zunächst in einer allgemeinen Übersicht aufbereitet. Darauf folgend werden die einzelnen Veröffentlichungen inklusive aller relevanten Daten dargestellt. Die wichtigsten Erkenntnisse werden dabei zusammengefasst.

Kapitel 4 entwickelt entlang der Struktur des Forschungsrahmenwerkes eine Analyse der Leitfrage. Dabei geht der kritische Diskurs vor allem auf die Resultate der einzelnen Publikationen ein und setzt diese in den Kontext des lerntheoretischen Modells. Außerdem wird innerhalb des Kapitels auf die Limitationen der verwendeten Ansätze eingegangen und zuletzt eine Zusammenfassung bezüglich der wichtigsten Erkenntnisse gegeben.

2. Forschungsrahmenwerk

Innerhalb des Forschungsrahmenwerks werden exemplarisch zunächst die wichtigsten Begriffe definiert. Auf Grundlage dieser Definition wird danach der Ansatz der Dissertation zur Bearbeitung der Forschungsleitfrage beschrieben. Dieser beinhaltet die Struktur, das Zusammenspiel der einzelnen wissenschaftlichen Veröffentlichungen und den Bezug zur Leitfrage. Letztlich werden innerhalb des Kapitels, um den späteren kritischen Diskurs vorzubereiten, auch auf die Auswahl des Lernmodells eingegangen.

2.1. Begriffserläuterung und Annahmen

Auswahl und Einfluss auf den Inhalt der Arbeit: Zur Schärfung des thematischen Ansatzes ist es zunächst notwendig auf die wichtigsten Definitionen einzugehen. Dabei werden Begriffe, die für den wissenschaftlichen Ansatz der Dissertation einen Einfluss besitzen, dargestellt. Anschließend wird auf den Einfluss bezüglich Betrachtungs-schwerpunkt und vor allem Aspekten, die nicht innerhalb dieser Dissertation behandelt werden können, eingegangen. Diese Abgrenzung dient ebenfalls dem genauen Verständnis, was unter diesen Begriffen innerhalb dieser Dissertation zu verstehen ist. Dafür werden zunächst die Kernbegriffe des Titels genauer definiert.

Aus dem Titel: „*Social Networks* im Zeitalter des demographischen Wandels: *Senioren* als „*Digital Immigrants*" in *virtuellen Umgebungen*" werden die farblich markierten Kernbegriffe innerhalb der Einleitung spezifiziert. Dabei geht die Spezifikation über eine einfache Definition hinaus, sondern vergleicht verschiedene Definitionsansätze und beschreibt den Kontext, in welchem die Begriffe innerhalb der Forschungsarbeit verwendet werden. Hierbei ist besonders die weite Auslegung des Begriffs der virtuellen Umgebungen und die Schärfung des Begriffs der Digital Immigrants von Relevanz, denn deren Definitionen müssen konsistent zu den daraus abgeleiteten Forschungsansätzen der Arbeit sein.

Definition Social Networks (Sites): Die SNS bilden im Zusammenhang der Arbeit das zentrale Interaktionsmedium (nicht nur für Senioren, sondern allgemein für die Nutzer von SNS). Infolgedessen beeinflussen die SNS auch für die Betrachtung der Interaktion von Nutzern, denn ihre Funktionalität beeinflusst viele Faktoren des virtuellen Austauschs (wie z.B. Kontakthäufigkeit, Anwenderfreundlichkeit, Kommunikationsart- und Geschwindigkeit, etc.).

Durch diese spezifische Stellung ist es notwendig den Begriff der SNS näher zu beschreiben und für den Forschungsansatz abzugrenzen. Da die Leitfrage der Arbeit eine Evaluation der möglichen Einbindung von Senioren in virtuelle Umgebungen ist, spielen SNS als Repräsentanten von virtuellen Umgebungen eine wichtige Rolle. Um abzugrenzen, was genau unter SNS zu verstehen ist, nähert sich die Arbeit zunächst mit einer deskriptiven Definition des Begriffs.

Social Network Sites: "*web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they*

share a connection, and (3) view and traverse their list of connections and those made by others within the system" (Boyd & Ellison, 2007, S.90).

Die Definition von Boyd & Ellison zu Social Network Sites geht auf drei Kriterien ein, die auch für die Betrachtung in dieser Arbeit relevant sind.

(1.) Erstens stellt das (halb)öffentliche Profil des Benutzers eine virtuelle Repräsentation der Person da. Die Person selbst ist innerhalb des Internets also durch ein Abbild repräsentiert, in diesem Falle dem eigenen Profil. Bezogen auf die Forschungsleitfrage ist ein solches Profil allerdings nicht nur auf SNS reduziert, sondern könnte auch andere Profile beinhalten. Ein Beispiel könnten persönliche Daten, die zu einem Profil aggregiert werden, innerhalb eines Ambient Assistent Living Systems (AAL) sein. Diese Daten würden automatisiert aggregiert und in Profilform aufbereitet werden (welches nur vom Benutzer und autorisierten Personen eingesehen werden kann, somit also die Eigenschaft der Halböffentlichkeit erfüllt).

(2.) Zweitens geht die Definition auf die Interaktion mit anderen Nutzern ein. Der Aufbau dieser Verbindungen beschreibt den Netzwerkcharakter dieser Seiten. Auch hier ist die Definition nicht exklusiv auf typische soziale Netzwerke beschränkt. Vielmehr könnten im oben skizzierten Beispiel die Nutzer von AAL Systemen in Nachbarschaftsverbünden zusammengeschlossen werden. Innerhalb dieser Verbünde ist die Kontaktaufnahme durch virtuelle Systeme oder zeitnahe Hilfeleistungen möglich. Als Beispiel eines solchen Netzwerkcharakters innerhalb von AAL Technologie stellt das Bundesministerium für Bildung[13] und Forschung besonders die Sozialumgebung als ein Charakteristikum der AAL-Technologie heraus.

(3.) Drittens geht die Beschreibung auf die Option der Nutzer ein, die eigenen Kontakte zu erweitern beziehungsweise Teile des gesamten Sozialen Netzwerkes einzusehen. Eine ähnliche Argumentation wie bei den ersten beiden Aspekten zeigt auch bei diesem Punkt, dass die Definition wesentliche Kriterien anspricht, ohne diese auf einzelne Webseitentypen zu reduzieren. Dies ist für die vorliegende Arbeit essenziell, denn die Betrachtung von Social Networks für Senioren soll sich bewusst nicht nur auf öffentliche Webseiten beschränken, sondern auch Optionen durch weitere Technologien mit einbeziehen.

Abgrenzung weiterer Definitionen für SNS: Erweitert man die Definition von SNS, so erweitert sich auch die deskriptiv-technische Beschreibung in eine allgemeinere, umfassendere Darstellung. Im Sinne des Begriffsverständnisses betrachten andere Fachrichtungen SNSs deshalb in einem allgemeineren Kontext. Die folgende Definition von Furht dient der thematischen Abgrenzung gegenüber einer mathematischen Auffassung, um den Betrachtungsrahmen der vorliegenden Dissertation weiter zu schärfen:

"*Social network is formally defined as a set of social actors, or nodes, members that are connected by one or more types of relations. Nodes, or network members, are the units that are connected by the relations whose patterns researchers study.*" (Furht, 2010, S.4)

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[13] Siehe hierzu auch im Detail (Bundesministerium für Bildung und Forschung, 2008) für eine Detailbeschreibung.

Aus mathematischer Perspektive handelt es sich bei sozialen Netzwerken um spezifische Formen von graphen-theoretischen Problemen. Diese stehen in dieser Arbeit nicht im Mittelpunkt, da die Analyse sich zunächst auf die kausale Interpretation der aktuellen Situation für Senioren und auf die Evaluation von Handlungsmustern fokussiert. Insofern bietet die Definition von Furht (2010) eine Möglichkeit der Abgrenzung gegenüber mathematischen Aspekten, die für diese Dissertation keine Relevanz besitzen.

Neben der mathematischen Auffassung von sozialen Netzwerken, gibt es auch eine soziologische Interpretation des Begriffs, der sich stärker mit den Akteuren und deren Beziehungen beschäftigt.

"*Als soziales Netzwerk im soziologischen Sinne versteht man eine abgegrenzte Menge von Knoten in der Form von Akteuren oder Akteursgruppen und einer Menge von Kanten, in Form von sozialen Interaktionen oder Beziehungen zwischen diesen Knoten.*" (Kapitza, 2011, S.56)

Aus soziologischer Perspektive stellen soziale Netzwerke ein Hilfskonstrukt für die Analyse von sozialen Interaktionen und Beziehungen dar. Diese werden zur Illustration und exemplarischen Analyse verwendet. Obgleich eine solche Betrachtung eine Ergänzung zum Schwerpunkt dieser Arbeit darstellen kann, liegt eine modellhafte Darstellung von Sozialbeziehungen nicht im Fokus der vorliegenden Arbeit.

Definition Senioren: Ursprünglich beschreibt der Terminus Senior als lateinisches Wort einen älteren Menschen, wobei dieser Begriff weder eine positive noch negative Konnotation beinhaltete. Bezogen auf die Verwendung des Begriffs der Senioren in der Forschungsliteratur existieren verschiedene methodische Näherungen.

a) Begriffsabgrenzung nach kalendarischer Methode

Bei diesem Ansatz geschieht die Begriffsdefinition durch die Reduktion auf das Erreichen eines Zielalters. Verhaltensstrukturen und weitere individuelle Einflussfaktoren werden nicht in die Bestimmung mit einbezogen[14]. Dies besitzt den Vorteil einer einfachen Beschreibung der Seniorengruppe auf Kosten der kausalen Reduktion auf das reine physische Alter. Ein Beispiel einer solchen Definition liefert die Darstellung der WHO, welche Senioren wie folgt einteilt:

"*There is no United Nations standard numerical criterion, but the UN agreed cutoff is 60+ years to refer to the older population*" (WHO, 2011)

Aufbauend auf die Definition von Digital Immigrants und die damit verbundenen Annahmen, dient die Einteilung von Senioren nach Maßgabe der WHO zum einen der klaren Abgrenzung entlang des demographischen Faktors Alter, zum anderen dient sie zur Sicherung der Arbeitshypothese bezüglich des Notwendigen Geburtszeitpunktes deutlich vor 1980.

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[14] Vergleiche hierfür auch eine Darstellung verschiedener Einteilungskategorien in (Reidl, 2007, S.13 ff.).

Abgrenzung weiterer Definitionen für Senioren: Mit der Wahl von 60 Jahren stellt sich so nämlich auch sicher, dass alle Personen innerhalb der Betrachtung dieser Arbeit zum Zeitpunkt der zunehmenden elektronischen Vernetzung schon Erwachsen waren.

b) Abgrenzung nach biologischen Faktoren

Als Kriterium für die Bestimmung von Senioren wird in diesem Zusammenhang die körperliche Alterung herangezogen. Dies ist in einem medizinischen Kontext sinnvoll, um die Funktionsfähigkeit von Organen oder Körperteilen zu beurteilen, allerdings ist eine Taxonomie des biologischen Alters auf dieser Grundlage kaum möglich. Zumal Befunde (auch optische Eindrücke bezüglich des biologischen Alters) sehr individuell zwischen den Personen ausgeprägt sein können.

Genau wie beim kalendarischen Ansatz birgt die biologische Betrachtung die Gefahr einer monokausalen Betrachtung des Seniorenbegriffs. Entgegen der vorhergehenden Betrachtungsform kommen allerdings die Ungenauigkeit der Bestimmung und ein entscheidender Aufwand mit hinzu. Bezogen auf die Betrachtung von Senioren im Kontext der Arbeit ist deshalb die biologische Definition des Seniorenbegriffs nicht im Schwerpunkt.

c) Weitere Begriffsabgrenzungsmöglichkeiten

Die weiteren Methoden für die Abgrenzung des Seniorenbegriffs (wie z.B. psychologische Kriterien oder familiäre Konstrukte[15]) stellen spezifische Betrachtungsschwerpunkte aus der Perspektive von Fachrichtungen dar. Ähnlich der Argumentation der rein biologischen Betrachtung können diese Begriffsbeschreibungen eine Erweiterung darstellen, passen aber nicht zum Schwerpunkt der Arbeit.

Da die Leitfrage der Arbeit spezifisch auf das Alter der Nutzer von SNS abzielt (siehe Digital Immigrants im nächsten Abschnitt), wird analog die Nutzung des Seniorenbegriffs durch einen alterstypologische Beschreibung verwendet.

Definition Digital Immigrants: Aufbauend auf der Definition von Senioren, werden diese unter dem Aspekt der Nutzung von Computern betrachtet. Hierbei liegt die Taxonomie der Digital Natives von Prensky zu Grunde. Prensky gibt hierbei eine mögliche Einteilung von Personen, die vor 1980 geboren wurden als Digital Immigrants an. Um den Begriff detaillierter zu verstehen, hilft folgendes Zitat:

Digital Natives: "*Our students changed radically. Today's students are no longer the people our educational system was designed for. […] Computer games, email, the Internet, cell phones and instant messaging are integral parts of their lives. [...] it is very likely that our students' brains have physically changed - and are different from ours - as a result of how they grow up.*" (Prensky, 2001, S.23)

Prensky beschreibt den Wandel zum Digital Native also auch mit einer aktiven Komponente, was impliziert, dass nicht alleine das Alter, sondern auch der in früher Kindheit gelernte

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[15] Vergleiche für die Details auch (Reidl, 2007, S.15-21).

Umgang mit technologischen Mitteln (wie z.B. Computerspiele, dem Internet oder Mobiltelefonen) zur automatischen Adaption führen[16].

Prensky gibt in seiner Arbeit eine dedizierte Definition von Digital Natives, da in seiner Einteilung allerdings nur zwei gegensätzliche Gruppe existieren, dienen die Digital Immigrants insofern als „Auffangbecken" für Personen, die keine Digital Natives sind. Diese Einteilung wird beispielsweise anhand von Altersgruppen beschrieben.

"*People that remembered life before personal computers and had to adapt to its use*" (Prensky, 2001, S.24)

Dieser Aspekt besitzt eine hohe Relevanz für die Betrachtung der Problemstellung, denn er impliziert, dass eine junge Person, die ohne diese elektronischen Einflüsse aufgewachsen ist, genauso zu der Gruppe von Digital Immigrants gehört. Dennoch ist die generelle Orientierung anhand des Alters nicht grundlegend falsch, denn zum einen existieren wesentliche Kerntechnologien, die für Vernetzung benötig werden (Internet, Mobiltelefone) erst seit den 1980er Jahren und entwickelten ihre Marktreife konsequent erst in den letzten 20 Jahren. Demzufolge besaßen Personen älterer Jahrgänge in aller Regel keinen Zugang zu solchen Schlüsseltechnologien, müssen diese also ex-post adaptieren.

Generell geht die Dissertation von der Arbeitshypothese aus, dass Personen, die deutlich vor 1980 geboren wurden zur Gruppe der Digital Immigrants zu zählen sind. Als Rationalisierung dieser Annahme ist anzuführen, dass Senioren (die wie später in diesem Kapitel definiert) vor 1953 geboren wurden so signifikant vor der Entwicklung von Kerntechnologien der elektronischen Vernetzung aufgewachsen sind, dass von statistisch insignifikanten Chancen für die Existenz von Digital Natives in dieser Personengruppe ausgegangen werden kann.

Definition virtuelle Umgebungen: Als letzter Begriff für die Arbeit wird die virtuelle Umgebung dargestellt. Beschreibt die Definition der Digital Immigrants eine Personengruppenaufteilung entlang der ihrer Fähigkeiten im Umgang mit dem Computer, so kann eine virtuelle Umgebung konsequent als eine solche Umgebung betrachtet werden, die durch den Computer erstellt beziehungsweise mit ihm zugängig gemacht wird.

„*The term virtual environment is often used as a synonym for both virtual reality and virtual world. However, use of the term virtual environment actually predates the phrase virtual reality. Virtual environment is ambiguous in that it can be defined as a virtual world or as a world presented in a particular virtual reality hardware configuration.*" (Sherman & Craig, 2003, S.16-17)

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[16] Für eine detailliertere Betrachtung des Begriffs der Digital Natives hilft folgendes Zitat:
„*Unter der Bezeichnung „Personalisierung", „mobile digitale Lösungen" und „Vernetzung" fasst Rohrmann die Hauptmerkmale von Digital Natives zusammen.*" (Franke, 2011, S.7). Innerhalb des Artikels von Rohrmann setzt sich dieser mit dem Begriff und seiner definitorischen Schärfung auseinander.

Die Definition von Sherman und Craig geht auf den Umstand ein, dass virtuelle Umgebungen zum einen als rein virtuelle Welten (z.B. eine Onlinecommunity) oder als virtuelle Repräsentation von Teilen der Welt genutzt werden können (z.B. Online Model eines Hauses oder auch vernetzte Hardware, wie z.B. AAL Systeme). Besonders der zweite Teil der Definition spielt für die vorliegende Arbeit eine große Rolle. Dieser ist Konsistent mit der gewählten Definition von Social Network Sites, die auch reale Applikationen wie AAL-Systeme mit einschließen würden. Gleichfalls gilt dies auch für die virtuellen Umgebungen.

Um diese Konsistenz innerhalb des Forschungsansatzes zu wahren, hilft die Definition von Sherman und Craig, virtuelle Welten auch unter dem Hintergrund der Nutzergruppe Digital Natives / Immigrants zu verwenden. Personen können durch Personal Computer den Zugang zu virtuellen Umgebungen erhalten und ihr Verhalten in diesen Umgebungen dient als Umfeld, in dem die Forschungsfrage beleuchtet wird.

Abgrenzung weiterer Definitionen für virtuelle Umgebungen: Zur Abgrenzung gegenüber weiteren Verwendungen des Begriffes dient eine Definition von Barfield und Furness, welche mathematischer beziehungsweise stärker im Fachgebiet der Informatik angesiedelt ist:

„*We define a virtual environment as the representation of a computer model or database which can be interactively experienced and manipulated by the virtual environment participants.* " (Barfield & Furness, 1995, S.4)

In der Perspektive der Informatik handelt es sich bei virtuellen Umgebungen um Computermodelle, basierend auf Datenbanken, die für die Analyse verwendet werden können. Obgleich diese Definition keinen der oben beschriebenen Fälle ausschließen würde, liegt der Schwerpunkt der Beschreibung auf der Modellierung einer solchen Umgebung.

Um Missverständnisse in der Benutzung des Begriffs zu vermeiden, muss der Begriff auf die Forschungsleitfrage ausgerichtet sein. Konsequenter Weise soll die Informatik-spezifische Definition von Barfield und Furness nicht im Fokus der Arbeit liegen. Wenn von virtuellen Umgebungen innerhalb der Arbeit gesprochen wird, so wird der Begriff mit Bezug auf die Definition von Sherman und Craig verwendet. Dieser ist konsistent gegenüber den Begriffen der Digital Immigrants und fokussiert auf die Analyse von Nutzerverhalten in Umgebungen, die durch einen Computer zugänglich gemacht werden.

2.2.   Lernmodelle und Auswertung

Relevanz von Lernmodellen für die Dissertation: Bezogen auf die Dissertation stellt die Analyse des Verhaltens der Senioren durch Lernmodelle in zweierlei Hinsicht einen wichtigen Mehrwert dar.

a) Zum einen folgt aus der Darlegung der allgemeinen Problemstellung dieser Arbeit, dass sich durch die *Segregation von Senioren* in virtuellen Umgebungen zunehmender Handlungsbedarf ableiten lässt.

Unter Segregation in diesem Zusammenhang ist der Umstand zu verstehen, dass Digital Immigrants (welche Senioren sind) deutlich weniger Kontakt zu anderen Nutzern in virtuellen Umgebungen besitzen und unterrepräsentiert sind. Dies äußert sich vor allem in einer niedrigeren Partizipation von Senioren in SNS[17]. Unter der Annahme, dass die Relevanz des Internets[18] und der damit verbundenen virtuellen Umwelten auch weiterhin steigt, werden zunehmend alltägliche Handlungen immer weiter mit Technik unterstützt beziehungsweise grundlegend verändert werden (siehe hierfür z.B. die Art der gemeinsamen Kommunikation).

Eine zunehmende Segregation von Senioren in diesem Sektor würde als Konsequenz eine Nicht-Teilnahme an einer steigenden Anzahl von gesellschaftlichen Interaktionsbereichen (z.B. Zunahme von Online-Shopping, virtuellen Geschäften[19], etc.) zur Folge haben. Somit stellt das (Er-)Lernen des Umgangs mit virtuellen Umgebungen für Senioren einen zwingenden Schritt dar, um weiterhin eine gesicherte gesellschaftliche Teilhabe zu besitzen.

Diese Beobachtungen gehen mit dem in den letzten Jahren zunehmend beschriebenen Trend des lebenslangen Lernens[20] einher. Ebenso fällt das Lernen der Senioren in den Betrachtungsbereich des Erwachsenenlernens[21]. Letztlich spielt auch das Thema des Nicht-Lernens[22] bzw. der Lernabwehr eine Rolle.

b) Zum Anderen besitzen Lernmodelle eine Relevanz in der *Analyse der Ergebnisse*. Sowohl Handlungsintentionen als auch die beobachtbaren Handlungen können durch Lernmodelle versucht werden zu erklären. Der vorliegende Fall bietet somit eine exemplarische Grundlage, um die Prädiktionsqualität der Lernmodelle miteinander zu vergleichen. Ein Modell stellt immer eine Vereinfachung der Realität dar, muss aber in seiner Prädiktion dennoch den allgemeinen Verlauf eines Prozesses akkurat beschreiben können. Unter diesem Gesichtspunkt kann die Analyse eines exemplarischen Lernmodells einen weiteren Erkenntnisgewinn generieren.

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[17] Als Beispiel hierfür kann (Facebook, 2013) verwendet werden. Besonders Altersgruppen, die in die WHO Definition von Senioren (60+ Jahre) fallen würden, sind deutlich niedriger repräsentiert.

[18] Vergleiche hierzu http://news.bbc.co.uk/2/hi/technology/8552410.stm mit der Darstellung für das Internetwachstum seit 1998.

[19] Siehe hierfür auch (BBC, Verteilung der Nutzung im Internet, 2013a) mit einer Darstellung und Größe der wichtigsten Internetseiten. In den letzten Jahren ist ein zunehmender Trend des Online-Geschäfts in fast allen Bereichen des täglichen Lebens zu erkennen.

[20] Siehe auch die Darstellung und Bedeutung von lebenslangem Lernen in (Illeris, 2002, S.29). Thematische Relevanz für die Problemstellung dieser Arbeit spielt dabei u.a. die Aufgabe der Finanzierung von Lehrtätigkeiten (Illeris, 2002, S.29-30).

[21] Siehe hierzu als Vertiefung eine Einteilung von (Brookfield, 2000, S.19ff.). Der Autor geht dabei darauf ein, dass sich Erwachsenenlernen in vier Lernformen einteilen lässt. Zusätzlich sind in (Illeris, 2002, S.36-39) noch zwei weitere Dimensionen (emotional und sozial) beschrieben.

[22] Dieser Schwerpunkt wird in (Illeris, 2002, S.34-36) aufgegriffen. Hierbei werden Aspekte wie Nicht-Lernen, Falsch-Lernen und verschiedene Abwehrmechanismen dargestellt. Außerdem geht der Autor auf die Lösung von Lernblockaden ein.

Knud Illeris – Modell des Lerndreiecks: Illeris findet fürs Lernen in seinem Modell eine relativ weitgreifende Definition, indem sowohl Fähigkeiten im motorischen, kognitiven und psychodynamischen sowie sozialen Bereich beinhaltet werden. Als Lernen versteht er dabei:

„Alle Prozesse (…), welche zu relativ dauerhaften Veränderungen im Bereich der Fähigkeiten führen, seien sie motorischer, kognitiver, psychodynamischer (…) oder sozialer Art und nicht auf einem genetisch-biologisch bestimmten Reifungsprozess beruhen." (Illeris, 2002, S.30). Diese Definition ist ausführlicher als das englische Pendant[23].

Allgemein geht Illeris davon aus, dass Lernen aus zwei miteinander verbundenen Prozessen besteht. Zum einen aus einem externen Prozess zwischen dem Lernenden und seiner Umgebung (z.B. sozial, kulturell, materiell). Dieser kann in einer Wahrnehmung oder einer Beobachtung bzw. einer Reaktion der Umwelt liegen. Des Weiteren aus einem internen Prozess, welcher in einer psychologischen Abwägung und deren Erschließung des Lernenden für sich selbst stattfindet.

Betrachtet man die Definition, so beinhaltet Lernen einen Reifungsprozess. Dieser muss nicht-biologisch impliziert sein und kann in diversen Teilbereichen auftreten. Eine Reifung beinhaltet allerdings auch immer eine aktive Komponente des Lernenden, so basiert Illeris Lernkonzept auf einer konstruktivistischen Grundtheorie[24]. Das Individuum tritt nach dem Lernverständnis von Illeris in eine beidseitige Interaktion mit seiner Umgebung. Dabei werden gleichzeitig interne Lernprozesse angestoßen. Diese besitzen zwei Hauptfunktionen: den Lerninhalt und den Lernanreiz.

In dem Lerndreieck von Illeris bildet die Interaktion mit der Umwelt die vertikale und die interne Reflektion des Lerninhaltes die horizontale Achse des Dreiecks. Die Dimension zwischen Umwelt und Individuum wird als wechselseitig (doppelter Pfeil) markiert. Gleichzeitig werden die beiden Hauptfunktionen der internen Reflektion (Lerninhalt und Lernanreiz) als eine beidseitig bestimmende Wechselwirkung (ebenfalls doppelter Pfeil) markiert. Die Positionierung der beiden Komponenten über dem Individuum stellt die kognitive Auseinandersetzung mit dem Lernstoff dar.

Auf diesem Lerndreieck basierend konstuiert Illeris nun drei Dimensionen des Lernens (die jeweils an einem der Endpunkte des Dreiecks befindlich sind). Erstens stellt die Inhaltsdimension das Wissen, die Fähigkeiten und die Methoden des Lernens dar. Zweitens umfasst die Belohnungsdimension den Vergleich der zum Lernen notwendigen Energie und stellt diese einer potentiellen Motivation (z.B. Emotionen, erwartetem Nutzen oder genereller Lernbereitschaft) gegenüber. Drittens beschreibt die Interaktionsdimension die Reaktion des

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[23] Siehe hierzu "*Learning can broadly be defined as any process that in living organisms leads to permanent capacity change and which is not solely due to biological maturation or ageing*" (Illeris, 2002, S. 3). Im englischen Original spricht der Autor allgemein von "capacity change", ohne weiter auf die damit verbundenen verschiedenen Anwendungsfelder einzugehen. Insofern ist die Definition noch allgemeiner als die deutsche Übersetzung.
[24] Siehe hierzu auch *„es wird angenommen, dass der/die Lernende selbst in aktiver Weise sein/ihr Lernen in Form mentaler Strukturen aufbaut und konstruiert."* (Illeris, 2002, S.33).

Individuums auf Lernimpulse. Diese werden vom Betroffenen verarbeitet und in Abhängikeit von Ort, Umgebung und Vorerfahrung beeinflusst. Das finale Lerndreieck ist in Abbildung 1 dargestellt.
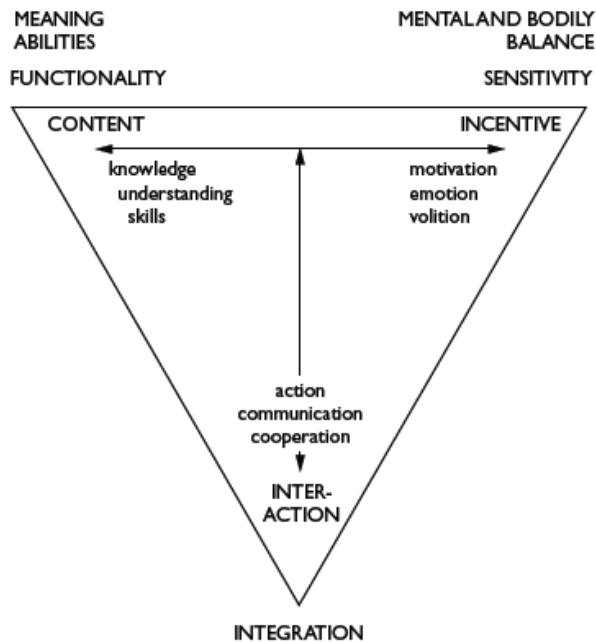
Abbildung 1: Darstellung des kompletten Lerndreiecks nach Knud Illeris (Originalversion in englischer Sprache)

(Illeris, 2002, S.10)

Illeris geht nun von dem Lerndreieck aus und beschreibt vier Arten des Lernens. Erstens stellt das kumulative Lernen[25] eine Methode dar, bei der Neues nicht als Teil von bestehenden Konstruktionen, sondern isoliert angeeignet wird. Hierbei setzt sich der Lernende mit dem Schema auseinander und fügt das neue Wissen einer separaten Kategorie hinzu. Dem gegenüber wird beim assimilierenden Lernen[26] der Inhalt zwar als neues Element kognitiv hinzugefügt, allerdings auch mit bestehenden Schemata verbunden. Somit fügt sich das neue Wissen in bestehende Strukturen/Kategorien ein. Das assimilierende Lernen[27] beschreibt die Anpassung bzw. den Abbau von bestehenden Schemata, um Platz für neue Lerninhalte zu schaffen. Dies geht im Regelfall mit einem Wandel der bestehenden Perspektiven und einer signifikanten Energieaufwendung für die initiale Veränderung der bestehenden Lernschemata einher. Letztlich beschreibt das Transformative Lernen[28] die simultane Restrukturierung im kognitiven, emotionalen und gesellschaftlich-sozialen Bereich. Eine derart signifikante Neuordnung beinhaltet auch das Hinterfragen von bestehenden Grundwerten und ist oft nach Krisensituationen beobachtbar.

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[25] Siehe hierzu auch (Illeris, 2002, S.33).

[26] Siehe hierzu auch (Illeris, 2002, S.33).

[27] Siehe hierzu auch (Illeris, 2002, S.34).

[28] Siehe hierzu auch (Illeris, 2002, S.35).

Auswahlkriterien für betrachtete Modelle: Bei der Auswahl des Lernmodells, die für den Lernerfolg der Senioren in virtuellen Umgebungen verwendet werden kann, folgt die Dissertation der Argumentation eines Lernverständnisses nach Knud Illeris. Die Wahl fiel in diesem Zusammenhang auf Illeris, weil seine Darstellung von Lernen sowohl eine hohe Relevanz[29] in der wissenschaftlichen Diskussion zum Thema Lernen beinhaltet, als zum anderen auch die Möglichkeit eröffnet, separate Teilprozesse des Lernens voneinander zu trennen.

Die prozessuale Auffassung von Illeris bezüglich des Lernens harmonisiert weiterhin mit der Leitfrage der Dissertation. Denn um eine plausible Antwort auf die Frage nach Integrationsmöglichkeiten von Senioren zu finden, helfen Lernprozesse sowohl das bisherige Verhalten systematisch dediziert darzustellen als auch aufzuzeigen, welche dauerhaften Veränderungen in jenem Verhalten notwendig sind, um die Senioren besser zu integrieren[30].

Im Umkehrschluss gilt nach diesem Verständnis, dass eine Reduktion des Lernens auf nur eine der Dimensionen zwangsläufig zu einer selektierten Betrachtung eines Teiles des Lernprozesses führt. In der Übertragung auf die vorliegende Arbeit muss das verwendete Lernmodell zur Beobachtung des Lernverhaltens also folgerichtig beide Dimensionen miteinander verbinden.

Abgrenzung gegenüber klassischen Lerntheorien: Folgt man, wie gerade beschrieben, dem Lernverständnis von Illeris, so schärft die Abgrenzung gegenüber klassischen Lernmodellen weiter den Betrachtungsfokus. Jene klassischen Lernmodelle würden bezogen auf die Leitfrage der Dissertation also Teilbereiche des Lernverhaltens von Senioren betrachten, allerdings nicht interne und externe Prozesse gleichermaßen. Die Abgrenzung dient also gleichsam der Bestätigung, warum auf spezifische Lernmodelle innerhalb dieser Arbeit nicht zurückgegriffen wird.

Behaviorismus[31]: Bezogen auf den Behaviorismus als Lernmodell führt dessen Fokussierung auf interne kognitive Lernprozesse zu einer selektiven Betrachtung des gesamten Lernprozesses. Dabei wird der Einfluss der externen Umgebung aufgeblendet. Der daraus resultierende Ausschluss als potentiell erklärendes Modell unterstreicht Illeris selbst mit folgendem Zitat: „*This may, for instance, be said of traditional behaviourist and cognitive learning theories focusing only on the internal psychological process*" (Illeris, 2002, S.9).

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[29] Siehe hierzu unter anderem auch (Siebert, 2012, S.17 ff. und S.22-23) für einen Diskurs über verschiedene aktuelle Lerntheorien. Ein weiteres Beispiel findet sich unter (Nuissl, 2008, S. 291 ff.), auf hier wird das Konzept des Lerndreiecks zur Grundlage der Erwachsenenbildung herangezogen. Weiterhin wird mit Bezug auf die geschichtliche Entwicklung der Erwachsenenbildung in (Nuissl, 2006, S.29 ff) bzw. im Detail in (Illeris, 2002, S.8 ff.) eingegangen.

[30] Siehe hierfür unter anderem die Definition von Lernen von Illeris und dessen Verständnis von Veränderungen im Fähigkeitsbereich der lernenden Person (weiter unten).

[31] Siehe hierzu in einer Vertiefung auch (Maschack, 2011, S.7ff.)

Kognitivismus[32]: Beim Kognitivismus fokussiert sich die Erklärung des Lernmodells rein auf die Umweltwahrnehmung. Durch die Darstellung der internen Lernprozesse als Blackboxmodell geschieht genau wie beim Behaviorismus eine Fokussierung auf nur eine der beiden Lerndimensionen. Ähnlich argumentiert auch Illeris, der schreibt: „*It can equally be said of certain modern social learning theories which – sometimes in explicit opposition to this – draw attention to the external interaction process alone*"(Illeris, 2002, S.9).

Konstruktivismus[33]: Obwohl der Konstruktivismus im Gegensatz zu den anderen beiden Lerntheorien zwei Dimensionen betrachtet, ist die Interaktion zwischen diesen beiden Dimensionen vollkommen auf den Lernenden ausgerichtet. Diese einseitige Betrachtung impliziert, dass der Lernende als Akteur und die internen und externen Prozesse einzig als Reaktoren zu verstehen sind. Somit liegt der Konstruktivismus zwar im Sinne der Einbeziehung zweier Perspektiven am ehesten an dem Selektionskriterium für Lernmodelle dieser Dissertation, dennoch ermangelt es ihm an einer wechselseitig beeinflussenden Komponente.

2.3. Forschungsansatz

Verbindung mit der Leitfrage: Bezogen auf die Leitfrage: „*inwiefern können Senioren als Repräsentanten der Digital Immigrants effizienter in die Interaktion in virtuellen Umgebungen eingebunden werden?*" gilt es zunächst schrittweise einen Ansatz zu definieren, um eine fundierte Antwort zu generieren.

Zunächst fällt bei der Fragestellung auf, dass für eine Antwortmöglichkeit als erster Schritt ein Erkenntnisbedarf besteht – nämlich darüber, wie die aktuelle Forschung innerhalb des Themenkomplexes bereits fortgeschritten ist. Auf Grundlage dieser Erkenntnisse ist eine dedizierte Analyse überhaupt erst möglich, denn die Arbeit muss sich zwingend mit bestehenden Theorien und deren Abbildung in der Realität auseinandersetzen.

Sollte hinreichen Hintergrundinformation für den Themenkomplex von Senioren in virtuellen Umgebungen bestehen, kann der zweite Teil der Leitfrage beantwortet werden. Nämlich mit welchen Methoden eine effizientere Einbindung der Digital Immigrants erreicht werden kann. Betrachtet man generell die Interaktionen von Senioren in virtuellen Umgebungen unter der Annahme, dass diese effizienter gestaltet werden können, so sind diese nur unter zwei notwendigen Voraussetzungen erfolgreich.

Erstens muss eine stärkere Einbindung von Senioren in virtuelle Umgebungen einen signifikanten Mehrwert für die Beteiligten schaffen (folglich also ihre aktuelle Situation subjektiv verbessern). Die Präferenzstruktur der Zielgruppe der Senioren spielt also eine wesentliche Rolle. Folglich muss, um die Leitfrage nach einer effizienteren Einbindung zu beantworten, die Präferenzstruktur von Senioren analysiert und Differenzen gegenüber anderen Nutzergruppen aufgezeigt werden.

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[32] Siehe hierzu auch (Bosselmann, 2004, S.8ff.).
[33] Vergleiche hierzu auch (Graf, 2011, S.6ff.).

Zweitens müssen bislang unzureichende bzw. fehlende Ansätze in den verschiedenen Märkten existieren, um zu rechtfertigen, dass noch nicht hinreichend viel unternommen wird, um Senioren in virtuelle Umgebungen einzubinden. Hierzu gilt es, aktuelle Trends zu evaluieren, und auf dieser Grundlage mithilfe von vorher festgelegten Kriterien zu bestimmen, inwiefern eine detailliertere Einbindung geschehen könnte.

Letztlich besteht die so beschriebene Vorgehensweise bislang aus einer rein handlungsintentionalen Ebene und müsste vollständigkeitshalber mit einer realen Beobachtung von Entscheidungen der Zielgruppe hinterlegt werden. Aufgrund der gewonnenen Erkenntnisse können so Lernfortschritte mit verschiedenen Methoden gegeneinander abgewogen werden, um festzustellen welche Faktoren in der Praxis die Integration von Senioren beeinflussen.

Darstellung des Rahmenwerkes: Ausgehend von der Leitfrage und der daraus resultierenden Herleitung stellt Abbildung 2 das Rahmenwerk des Forschungsansatzes dar.
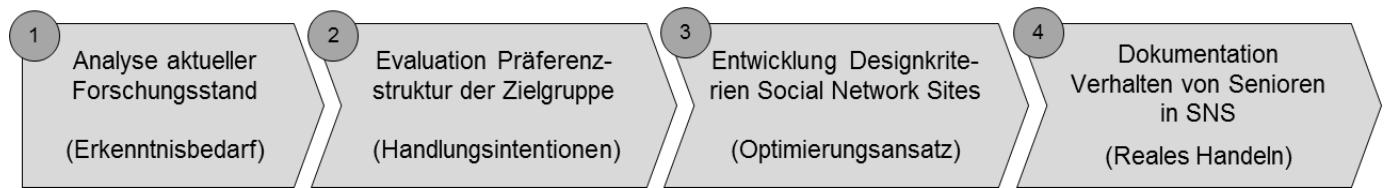
Abbildung 2: Darstellung der vier Phasen des Forschungsrahmens

(eigene Darstellung)

Zur Beantwortung des initialen Erkenntnisbedarfs der Leitfrage nutzt das Rahmenwerk eine Metaanalyse der aktuellen Forschungsliteratur. Hierbei werden nach definierten Suchparametern und einem Kriterienkatalog relevante Artikel selektiert. Als relevant in Bezug auf die Leitfrage gilt dabei jene Forschungsliteratur, die sich im weiteren Kontext mit dem Verhalten von Senioren in virtuellen Umgebungen beschäftigt[34]. Die so selektierten Artikel dienen zur Analyse des aktuellen Status im internationalen wissenschaftlichen Diskurs.

Darauf aufbauend setzt der zweite Teil, nämlich die Evaluationsphase, an. Hierbei zielt der Forschungsansatz auf die Analyse von Handlungsintentionen der Zielgruppe ab. In Fragebögen gilt es dabei die Präferenzen der Senioren zu analysieren. Hierbei handelt es sich um einen quantitativen Ansatz, der auf Grundlage von strukturierten Erhebungsinstrumenten und einer ex-post Analyse eine Quantifizierung der vorhandenen Präferenzstrukturen anstrebt.

Mit diesen Präferenzen können im dritten Schritt des Modells die aktuellen Social Network Sites analysiert werden. Hierbei ist die Beobachtung und Evaluation mit Hilfe eines

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[34] Dabei gilt, dass sichergestellt werden muss inwiefern die Forschungsvertiefung der Artikel mit den Definitionen der Begriffe Senioren (als Gruppe 60+), virtuellen Umgebungen (in weitgefasster Definition) und Aktivitäten übereinstimmt.

Kriterienkatalogs geplant. Dieser stellt eine qualitative Beschreibung auf Grundlage von vorher durchgeführten Interviews dar.

Zuletzt wird in der Phase vier das reale Handeln der Zielgruppe überprüft. Diese kann mithilfe eines kontrollierten Experimentes mit verschiedenen Einflussfaktoren untersucht werden. Der somit verwendete quantitative Ansatz stellt zum einen eine reale Beobachtung des Handelns der Zielgruppe dar. Zum anderen dient er indirekt auch als Validationsinstrument der vorher analysierten Handlungsintentionen.

Ablauf der einzelnen Ansätze: Die Metaanalyse bestehender Forschungsliteratur wird in Abbildung 3 im Detail illustriert. Dabei findet im ersten Schritt zunächst eine Auswahl der Datenbanken in Kombinationen mit den Suchkriterien statt. Aufbauend auf diesen Faktoren werden die Titel und Zusammenfassungen aller gefundenen Artikel auf Themenzugehörigkeit überprüft. Hierbei wird der skizzierte Inhalt insbesondere mit den Definitionen der Begriffe und der potentiellen Relevanz für die Leitfrage analysiert. Als Systematik bei diesem Vorgang wird ein Großteil der Treffer bereits in dieser ersten Hürde exkludiert.
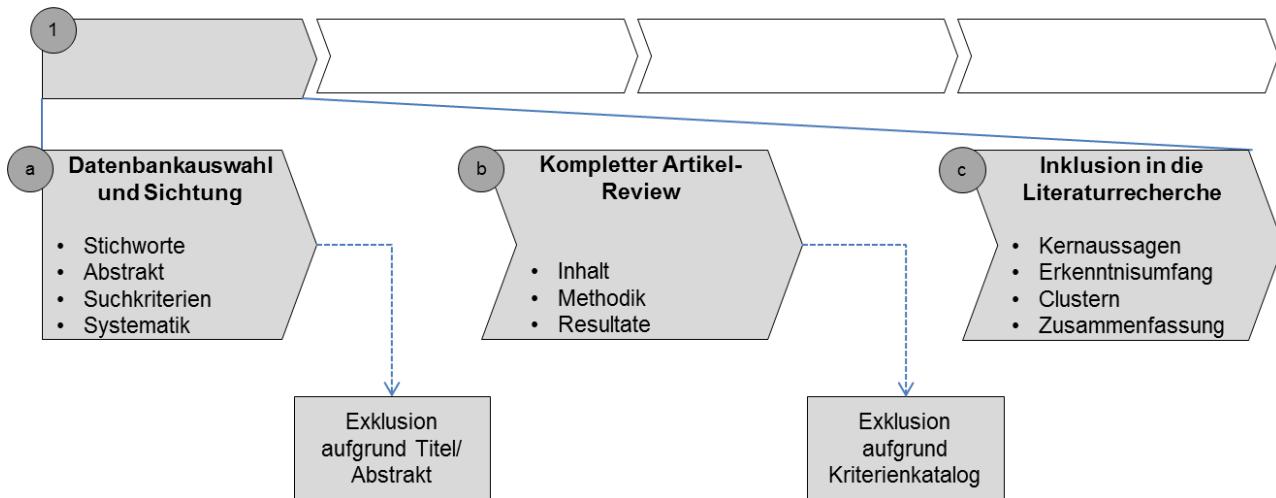
Abbildung 3: Detaildarstellung Analysephase des aktuellen Forschungsstandes

(eigene Darstellung)

Im zweiten Schritt werden die verbleibenden Artikel bezüglich des Inhalts im Detail geprüft. Dabei werden die Methodik, die Resultate, wesentlichen Ergebnisse und der Forschungsfokus notiert. Auch in diesem Schritt werden Artikel, die inhaltlich nicht zum Forschungsthema Senioren in virtuellen Umgebungen passen, exkludiert. Die somit verbleibenden Artikel werden in einer Literaturrecherche zusammengefasst und bezüglich ihrer Attribute wie Forschungsansatz, Kernaussagen oder Zielgruppe in Gruppen eingeteilt. Mit diesen Gruppen ist dann eine systematische Beantwortung der Frage nach dem aktuellen Forschungsstand möglich.

In der Abbildung 4 wird die zweite Phase des wissenschaftlichen Rahmenwerkes dargestellt. Die bestehenden Artikel dienen als Grundlage für eine Analyse der Präferenzstrukturen der

Zielgruppe. Nachdem aufgrund der ersten Analyse die bisherigen Erkenntnislücken identifiziert wurden, versucht diese Phase einen Teil dieser Lücken zu schließen.
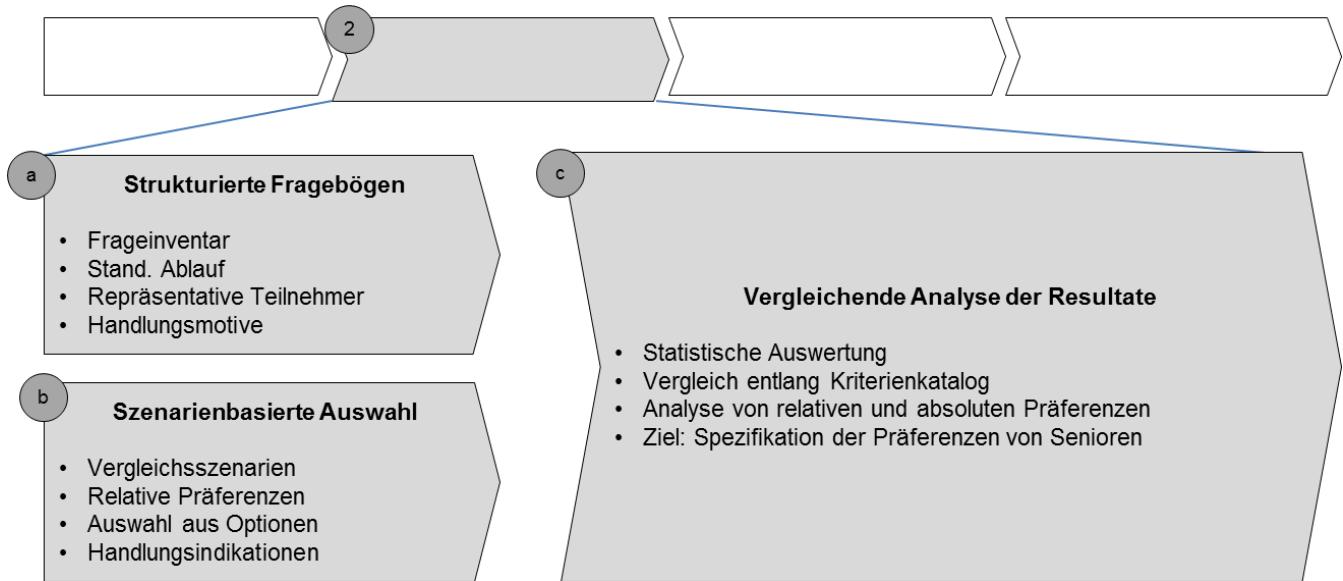
Abbildung 4: Detaildarstellung der Evaluationsphase der Präferenzen von Senioren

(eigene Darstellung)

Dabei besteht der Ansatz zunächst aus strukturierten Fragebögen, die die Präferenzen der Senioren bezüglich Interaktion in virtuellen Umgebungen analysieren. Sowohl der Aufbau der Fragebögen als auch die damit verbundenen Frageinventare und die Auswahl der Testgruppen spielen eine wichtige Rolle in der Gestaltung der Evaluation[35]. Die Fragebögen zielen auf die Diagnose der absoluten Präferenzen ab. Dabei geht es um das Verständnis, welche Aspekte die virtuelle Interaktion am meisten aus Sicht der Zielgruppe beeinflussen.

Basierend auf den Ergebnissen der ersten Fragebögen (unterschiedliche Inventare, vergleichbare repräsentative Stichproben an Teilnehmern), wird im zweiten Schritt des Ansatzes nun die relative Präferenz der Teilnehmer überprüft. Die gesammelten Informationen bezüglich der Einflussfaktoren für Interaktion in virtuellen Umgebungen werden in Szenarien zusammengefasst. Des Weiteren werden zusätzliche Szenarien entlang bereits bestehender Produkte (wie z.B. AAL Systeme) aufgebaut. Im relativen Vergleich dieser Szenarien müssen die Teilnehmer der Befragung nun die Relevanz der Faktoren erneut bewerten. Diese weitere Beobachtung präzisiert die Handlungsintentionen der Senioren.

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[35] Vergleiche für die Hintergründe unter anderem (Armstrong, 2009) für den Aufbau und generelle Designfaktoren, (Brace, 2008) für spezifische Betrachtung von Onlinefragebögen (Broekhuizen, 2006) und für Qualitätsfaktoren und Meßmethoden in empirischen Studien (Schnell, Hill, & Esser, 2011).

Konsequent werden beide Fragebogenarten in einer gemeinsamen Auswertung miteinander verglichen. Die so gesammelten Resultate bieten sowohl einen absoluten als auch einen relativen Überblick bezüglich der Präferenzen der Zielgruppe.

Im nächsten Schritt beschreibt Abbildung 5 die dritte Phase des Forschungs-rahmenwerkes. In diesem Teil sollen die gesammelten Informationen mit den auf dem Markt verfügbaren Möglichkeiten verglichen werden. Um diesen Vergleich zu realisieren, ist eine systematisierte Analyse der bestehenden SNSs notwendig.
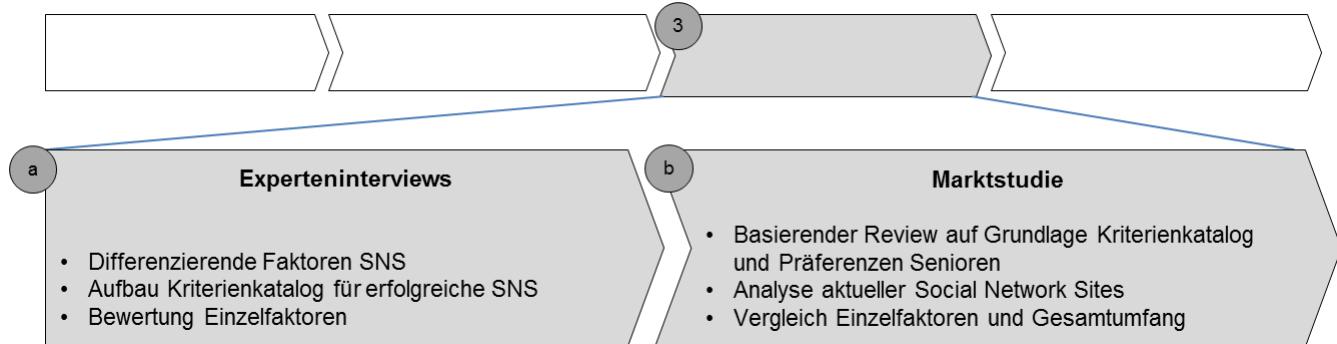
Abbildung 5: Detaildarstellung der Analyse und Designphase

(eigene Darstellung)

Im ersten Teil dieser Phase dienen Experteninterviews zum Aufbau eines Kriterienkataloges. Dabei werden in verschiedenen Interviews Experten zu relevanten Funktionen von SNS befragt. Diese werden in Kategorien eingeteilt und bilden in Summe den Kriterienkatalog für die Evaluation der aktuellen Funktionalität der Webseiten.

Im nächsten Schritt wird in diesem Teil des Forschungsrahmenwerkes eine Marktstudie durchgeführt. Ziel dabei sind die relevanten deutschsprachigen Social Network Sites, welche mit dem eingangs definierten Kriterienkatalog verglichen werden. Das Resultat dieser Analyse ist die Darstellung des aktuellen Marktangebotes, welches daraufhin mit den Bedürfnissen der Senioren verglichen werden kann.

Im letzten Schritt des Rahmenwerkes wird in einem kontrollierten Experiment das reale Verhalten der Zielgruppe beobachtet. Entgegen der bisherigen Handlungsintentionen, geht es in dem in Abbildung 6 dargestellten Ansatz um die Analyse der realen Handlungen von Senioren.
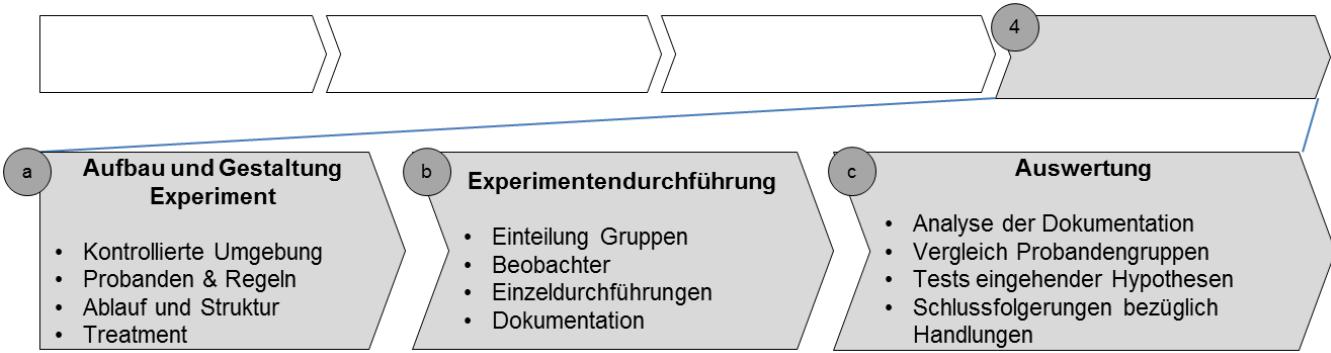
Abbildung 6: Detaildarstellung der Experimentalphase

(eigene Darstellung)

Dafür wird zunächst das eigentliche Experiment erstellt. Dies beinhaltet die Beschreibung der kontrollierten Umgebung, die Auswahl der Probanden, den Ablauf und die Struktur sowie die Behandlungen der einzelnen Teilgruppen[36].

Dieser Struktur folgend wird das Experiment mit der Testgruppe und geschulten Beobachtern wiederholt und die Ergebnisse detailgetreu dokumentiert. Jede der Einzeldurchführungen läuft hierbei hochstandardisiert ab, um eine Vergleichbarkeit der Testresultate zu gewährleisten.

Im letzten Schritt werden die Ergebnisse ausgewertet und die vorhandene Dokumentation als Grundlage für die Analyse verwendet. Diese wird mit den eingangs aufgestellten Hypothesen verglichen. Die Schlussfolgerungen aus diesem Ansatz geben dann Aufschluss über das reale Handeln der Senioren, welches wiederum gegenüber den indizierten Handlungsmotivationen verglichen werden kann.

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[36] Vergleiche für (Armstrong, 2009) für weitere Details.

3. Liste wissenschaftlicher Veröffentlichungen

Dieses Kapitel beinhaltet eine Übersicht zu den aktuellen Publikationen. Die Schriften werden dabei mit Veröffentlichungsort und diversen Hintergrundinformationen (wie z.B. Kennzahlen zur Relevanz der Veröffentlichungsorte) versehen.

Im verbleibenden Teil des Kapitels sind die Texte in Originalform und unverändert übernommen worden. Die Seitenzahlen und Beschreibungen referenzieren folgerichtig auf die jeweiligen Positionen in den Schriften bzw. in den Veröffentlichungsunterlagen.

3.1. Publikationsübersicht und Kontribution

I. Schrift[37]
Fritsch, Tobias, Steinke, Frederick & Silbermann, Lina (2013). Communication in Web 2.0: A Literature Review about Social Network Sites for Elderly People. *Proceedings of the IADIS ICT, Society and Human Beings 2013*, Prague, Czech Republic.

- Kontribution: Rahmenwerk, Durchführungsleitung, Methodik, Analyse, Publikationsverantwortung

II. Schrift[38]
Fritsch, Tobias, Steinke, Frederick & Brem, Daniel (2012). Analysis of Elderly Persons' Social Network: Need for an Appropriate Online Platform. *Proceedings of the Sixth International AAAI Conference on Weblogs and Social Media*, Dublin, Ireland, S.463-466.

- Kontribution: Rahmenwerk, Analyse, Diskussion, Publikationsverantwortung

III. Schrift[39]
Steinke, Frederick, Fritsch, Tobias, Brem, Daniel & Simonsen, Svenja (2012). Purchase Intention of Ambient Assisted Living Technology - Results from a German Perspective. *IADIS International Conference e-Health 2012*, Lisbon, Portugal, S.146-155.

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[37] Impact Faktor (Status Mai 2013): wird noch berechnet. Vergleiche hierzu auch http://journalseeker.researchbib.com/?action=viewJournalDetails&issn=16457641&uid=rcb084 (zuletzt überprüft 22.05.2013). **Impact Faktor 2012 war 5,49** (vergleiche hierzu http://www.ijcim.th.org/, zuletzt überprüft 22.05.2013).

[38] **Annahmerate: 21%** (laut eigener Angabe Mai 2013).

[39] Impact Faktor (Status Mai 2013): wird noch berechnet. Vergleiche hierzu auch http://journalseeker.researchbib.com/?action=viewJournalDetails&issn=16463692&uid=r456de (zuletzt überprüft 22.05.2013). **Impact Faktor 2012 war 5,49** (vergleiche hierzu http://www.ijcim.th.org/, zuletzt überprüft 22.05.2013).

- Kontribution: Rahmenwerk, Präferenzanalysen, Fragebogendesign und -review, Methodik, Analyse, Publikationsverantwortung

IV. Schrift[40]

Fritsch, Tobias (2012). An Approach towards Success Criteria of Social Network Sites for Elderly People. *Proceedings of the 9th International Conference on Applications of Social Network Analysis*, Zurich, Switzerland.

V. Schrift[41]

Fritsch, Tobias, Brem, Daniel, Steinke, Frederick, Muhl-Lassen, Andreas & Kerssenfischer, Frederik (2013). Social Network Sites for Elderly People - A Critical Analysis of Established German-Speaking Online Platforms. *Proceedings of the Conference on Economics Business and Marketing Management - CEBMM 2013*, Rome, Italy, S.182-186.

> **Und zusätzliche Journal - Veröffentlichung in:**
> Fritsch, Tobias, Brem, Daniel, Steinke, Frederick, Muhl-Lassen, Andreas & Kerssenfischer, Frederik (2013). Social Network Sites for Elderly People - A Critical Analysis of Established German-Speaking Online Platforms. *Journal of Economics, Business and Management, Vol.1, Nr.2*, S.182-186.

> - Kontribution: Rahmenwerk, Analyse, Diskussion, Publikationsverantwortung

VI. Schrift[42]

Steinke, F., Ingenhoff, A. & Fritsch, T. (2014): Personal Remote Assistance in Ambient Assisted Living – Experimental Research of Elderly People's Trust and Their Intention to Use, International Journal of Human- Computer Interaction, DOI: 10.1080/10447318.2014.903789

> - Kontribution: Konzeption & Rahmenwerk, Methodik, Analyse, Publikationsverantwortung

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[40] Impact Faktor (Status Mai 2013): wird noch berechnet. Vergleiche hierfür auch http://conference.researchbib.com/?action=viewEventDetails&eventid=16688&uid=r96e37 (zuletzt überprüft 22.05.2013).

[41] **Annahmerate: 40%** (laut eigener Angabe Mai 2013) bzw. fürs Journal wird der Impact Faktor (Status Mai 2013): noch berechnet, Vergleiche hierzu auch http://journalseeker.researchbib.com/?action=viewJournalDetails&issn=23013567&uid=re526e (zuletzt überprüft 22.05.2013). **Impact Faktor 2012 war 2,39** (vergleiche hierzu http://www.tandfonline.com/toc/tbem20/current , zuletzt überprüft 22.05.2013).

[42] Impact Faktor (Status Mai 2013): wird noch berechnet. Vergleiche hierzu auch http://journalseeker.researchbib.com/?action=viewJournalDetails&issn=09535438&uid=r4f2f2 (zuletzt überprüft 22.05.2013). **Impact Faktor 2012** war **1.233** und in den letzten **5 Jahren 1.455** (vergleiche http://iwc.oxfordjournals.org/, zuletzt überprüft 22.05.2013).

4. Kritischer Diskurs

Innerhalb dieses Kapitels werden zunächst die wichtigsten Erkenntnisse der Veröffentlichungen zusammengefasst. Auf dieser Grundlage ist ein konsistentes Bild der einzelnen Ansätze gegenüber dem gesamten Forschungsgegenstand möglich. Dies wird im zweiten Teil durch eine Verbindung mit der Leitfrage intensiviert. Dabei dient das Modell von Illeris zur Validierung und bietet selbst Grundlage ihren Erklärungsgehalt zu evaluieren. Im dritten Teil des kritischen Diskurses wird auf die bestehenden Forschungslimitationen der Publikationen und des gesamten Ansatzes eingegangen, bevor eine Zusammenfassung und ein Ausblick über weitere Forschungsoptionen innerhalb des Themenfelds gegeben werden.

4.1. Ergebnisübersicht

Bezogen auf die Veröffentlichungen, gilt es nun die wesentlichen Erkenntnisse in einer komprimierten Übersicht zusammen zu fassen (siehe hierfür Tabelle 1)

Tabelle 1: Überblick der wichtigsten Erkenntnisse geordnet nach Veröffentlichung.

(eigene Darstellung)

Veröffentlichung	Zentrale Erkenntnisse
Literaturanalyse (1. Veröffentlichung) Fritsch et al. (2013)	• Nachfrage nach zusätzlichen Online-Kommunikationskanälen bei Senioren steigt • Attraktivität des Forschungsgegenstandes „Senioren in virtuellen Umgebungen" wächst signifikant in den letzten drei Jahren • Einheitlicher Bedarf nach fundierten Hintergrundinformationen zum Thema besteht • Erfolgsfaktoren für Senioren in SNS sind bislang nicht in der wissenschaftlichen Betrachtung thematisiert
Präferenzanalyse (2. Veröffentlichung) Fritsch et al. (2012)	• Bestätigung bekannter Phänomene: Senioren haben Schwierigkeiten neue Kontakte zu knüpfen • Bestehender Bedarf der Senioren als häufiger Sozialinteraktion • Mehrheit der Senioren wünscht sich eine Vereinfachung der Kontaktaufnahme mit anderen • Mehrheit wünscht sich einen Zugang zum Internet als Möglichkeit der Interaktion, dennoch werden die bestehenden Möglichkeiten nicht genutzt
Szenarienanalyse (3. Veröffentlichung) Fritsch et al. (2012a)	• Stark positive Korrelation zwischen Einstellung gegenüber Produkten mit virtuellem Charakter und der Kaufbereitschaft • Risikoprävention und Sicherheit boten im Vergleich zu Produkten, die auf Komfort und Kontaktaufbau aufbauten, mehr Kaufanreiz • Hohe positive Korrelation zwischen der Wahrnehmung des Produkts und dem Vertrauen in dessen Technologie
Kriterienkatalog (4. Veröffentlichung) Fritsch (2012)	• Einteilung der Aspekte von SNS Seiten in einen Kriterienkatalog (mit drei Hauptkategorien: Sozialgemeinschaft, Forum und Inhaltsmanagementsystem) • Priorisierung der einzelnen Attribute entlang des Expertenfeedbacks
Marktanalyse SNS (5. Veröffentlichung) Fritsch et al. (2013b)	• Erfolg der Webseiten liegt nicht primär an Quantität, sondern Qualität der implementierten Funktionen • Inhaltsmanagementseiten (wie z.B. SNS mit starkem News-Fokus) hatten eine niedrige Wiederaufrufrate • Sozialgemeinschaften führten zu einer signifikant höheren Wiederaufrufrate

Experiment (6. Veröffentlichung) Fritsch et al. (2014)	• Persönliche Hilfestellungen bieten einen signifikant höheren Lern- und Motivationswert als eingebaute technische Assistenz • Vertrauen in die Technologie beeinflusst wahrgenommene Einfachheit des Nutzens und Reliabilität positiv • Wahrgenommener Nutzen und effektive Nutzung können positiv korrelieren, Ausblick auf weitergehende Forschungsfragen für Langzeitbetrachtungen

Die knappe Zusammenfassung in Tabelle 2 gibt lediglich einen groben Überblick bezüglich der Inhalte der einzelnen Forschungsansätze wieder. Eine detaillierte Zusammenfassung der einzelnen Veröffentlichungen findet sich innerhalb der jeweiligen Veröffentlichung. Um Redundanzen zu vermeiden, dient Tabelle 2 deshalb lediglich als Übersicht.

Zusammenhang mit dem Forschungsrahmen: Betrachtet man dabei die vier Phasen des Forschungs-Rahmenwerkes, so sind folgende Zusammenhänge zu beobachten.

1.) *Literaturanalyse und Abgrenzung Forschungsbereich*: In der ersten Phase (1. Veröffentlichung) wird die Suche nach einem potentiellen Erkenntnisdefizit im Bereich Senioren in virtuellen Umgebungen durch die Literaturanalyse beantwortet. Dabei umfassen die Erkenntnisse den Forschungstrend der letzten Jahre, sowie einen Bedarf an Grundinformationen, der eine weitere Beschäftigung mit dem Thema nahe legt. Senioren sind als Forschungsgegenstand hierbei zunehmend im Fokus der Erwachsenenbildung, die Interaktion in virtuellen Umgebungen stellt dabei ein wichtiges, aber bislang wenig thematisiertes Interaktionsfeld dar.

2.) *Präferenz- und Handlungsmotivationsanalyse der Zielgruppe (Senioren)*: In der zweiten Phase (2. & 3. Veröffentlichung) des Forschungsrahmenwerkes unterstreichen die Präferenz- und die Szenarienanalyse teilweise bekannte Umstände, eröffnet im Zusammenhang mit dem Internet allerdings auch weitere Aussagen. So wird z.B. der Wunsch der Senioren nach mehr sozialer Interaktion klar herausgestellt. Ebenso verhält es sich bei der Motivation von Senioren bezüglich der Vereinfachung von Kontaktaufnahmen mit anderen. Im Kontrast dazu zeigt die Verhaltensmotivation der Senioren allerdings, dass bestehende Möglichkeiten im Internet ungenutzt bleiben. Die Handlungsanalyse zeigt also einen Widerspruch zwischen Motivation der Senioren und Umsetzung in Verhalten auf.

3.) *Marktanalyse und Konzeption einer eigenen Lösung*: Die dazugehörige Angebotsseite von SNS wird innerhalb der dritten Phase (4. & 5. Veröffentlichung) des Forschungsansatzes behandelt. Die Angebotsseite dieser Seiten zeigt zum einen, dass die Aufstellung eines Kriterienkataloges verschiedenste Einflussfaktoren für den Erfolg von SNS impliziert. Zum anderen ist durch die Einordnung der Seiten auf Grundlage der initialen Faktoren ein differenzierteres Bild des Angebots entstanden. Wägt man dieses gegenüber dem Bedarf der Senioren ab, so können bereits konkrete Handlungsoptionen abgeleitet werden[43]. Bezogen auf das Rahmenwerk bilden Angebots- und Nachfrageseite zwei Grundlagen zur Analyse von realem Verhalten der Zielgruppe.

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[43] Diese werden exemplarisch in der nächsten Sektion inhaltlich vertieft (siehe Kapitel 4.2).

4.) *Experiment (reale Handlungsbeobachtung):* Dem entsprechend zielt der vierte Teil des Rahmenwerkes (6. Veröffentlichung) auf genau diese Beobachtung ab. Das Experiment gibt Aufschlüsse auf die Lernfähigkeit der Senioren in virtuellen Umgebungen und mögliche Einflussfaktoren. Die sechs Veröffentlichungen folgen stringent dem Muster des Rahmenwerkes, wie in Kapitel 2 beschrieben. Dabei wird ausgehend von den initialen Basiserkenntnisse aus der Literaturanalyse kritisch sowohl die Nachfrage- als auch Angebotsseite von SNS für Senioren betrachtet. Die so erhaltenen Erkenntnisse dienen dem Aufbau einer realistischen experimentellen Umgebung, anhand derer eine differenzierte Beantwortung der Leitfrage stattfinden kann.

4.2. Übergreifende Evaluation

Innerhalb der übergreifenden Evaluation der Resultate fokussiert sich das Rahmenwerk auf zwei Schwerpunkte: Erstens beinhaltet der kritische Diskurs die Analyse der Forschungsergebnisse mit Hinblick auf die Leitfrage der Dissertation. Zweitens wird die erziehungswissenschaftliche Perspektive mit Hilfe des Lernmodells von Knud Illeris betrachtet. Ziel ist es, die Prädiktionsfähigkeit des Modells am konkreten Beispiel der Senioren zu evaluieren.

4.2.1. Kritischer Diskurs bezüglich der Leitfrage

Um eine differenzierte Antwort auf die Leitfrage der Arbeit, nämlich *„inwiefern können Senioren als Repräsentanten der Digital Immigrants effizienter in die Interaktion in virtuellen Umgebungen eingebunden werden?"*, zu geben, folgt die Argumentation dem eingangs vorgestellten Rahmenwerk und nähert sich so dem Kern der Fragestellung.

Beginnend mit der Literaturanalyse unterstreichen die Erkenntnisse die Arbeitshypothese der Dissertation. Es herrscht in den letzten Jahren ein signifikanter Anstieg an Publikationen in diesem Themenbereich. Zusätzlich sind sich die Autoren vergleichbarer Artikel einig, dass weiterer Informationsbedarf besonders im Bereich der Hintergrundinformationen besteht. Zu wenig ist aktuell über die Senioren als Akteure in virtuellen Umgebungen und ihre Präferenzstrukturen bekannt.

Bezogen auf die Leitfrage leitet dies bereits eine erste implizite Teilantwort ab, denn nach bestehender Quellenlage ist die Zielgruppe trotz erkannter Problemstellung noch nicht hinreichend untersucht. Dies hat als Konsequenz, dass mit intensiverem Verständnis für die Zielgruppe und ihre Bedürfnisse weitere Integration von Senioren in virtuelle Umgebungen möglich ist. Zum Realisieren dieser Verbesserungen sind allerdings weitere Detailinformationen notwendig, welche die Notwendigkeit des Rahmenwerks und des Forschungsansatzes unterstreichen.

Für den ersten Teil der Leitfrage, nämlich die Fragestellung, ob Senioren als Repräsentanten von Digital Immigrants dienen können, können die Resultate der Literaturanalyse ebenfalls genutzt werden. Innerhalb der wissenschaftlichen Veröffentlichungen werden die aktuellen

Probleme von Senioren in virtuellen Umfeldern fast deckungsgleich mit denen von Digital Immigrants beschrieben. Dies unterstreicht die implizite Arbeitshypothese[44], dass Senioren als Digital Immigrants zu verstehen sind. Die Senioren erfüllen also nicht nur die durch die Definition in Kapitel 2.1 beschriebenen Alterskriterien, ihr Verhalten deckt sich mit dem beschriebenen Verhalten von Digital Immigrants. Sie stellen in diesem Bezug also eine echte Komplementärgruppe zu den Digital Natives dar.

Für die Leitfrage ist dies von Relevanz, weil sowohl die Definition der Digital Immigrants schlüssig ist als auch deren zu beobachtendes Verhalten mit der Problemstellung der Arbeit (potentielle Segregation von Digital Immigrants im Internet durch fehlendes Hintergrundwissen) übereinstimmt.

Zwischenergebnis: Senioren in den Befragungen decken sich vollständig mit den Eigenschaften von Digital Immigrants. Ihr Verhalten weist die gleichen Probleme im Internet auf. Aufgrund einer drohenden Segregation ist die Fragestellung nach potentiellem Erwachsenenlernen bzw. einer Integration der Senioren als relevant einzustufen.

Bezogen auf die Präferenzstrukturen der Senioren bieten die 2. & 3. Veröffentlichung Ansätze zur detaillierteren Auswertung. Die eingehende Befragung der Senioren unterstrich dabei, dass ein Defizit in der Aufnahme neuer Kontakte, in der Geschwindigkeit der Erweiterung des eigenen Sozialnetzwerkes und eine deutlich zu niedrige Integration in die virtuellen Umgebungen festgestellt werden konnte. Diese Ergebnisse belegen bereits bestehende Erkenntnisse, bei denen vergleichbare Testgruppen von Senioren ähnliche Wünsche äußerten.

Allerdings äußerten die Befragten bezüglich der Nutzung von SNSs, dass sie zwar das Potential neuer Kontakte über diesen Kanal erkennen, diesen allerdings nicht nutzen wollen. Innerhalb dieses Aspekts zeigt sich die Diskrepanz zwischen Präferenzstruktur der Senioren und Handlungsintentionen gegenüber virtuellen Umgebungen. Die eingehende Leitfrage kristallisiert sich anhand dieser Differenz, denn bestehende Möglichkeiten zur Interaktion mit anderen werden nicht genutzt (siehe hierzu Anmeldezahlen bei z.B. Facebook, 2013), gleichzeitig wird als Antwort auf die entsprechenden Fragen im Fragebögen das Bedürfnis nach höherem Kontakt artikuliert (siehe hierzu Veröffentlichung 2&3). Senioren wünschen sich also mehr Kontakt zu Mitmenschen, nutzen allerdings die bestehenden Optionen in virtuellen Umgebungen selten.

Eine mögliche Erklärung für diese Differenz liegt in der Nutzungskompetenz der Senioren für virtuelle Umgebungen. Die Annahme für diese Erklärung wäre, dass durch den Digital Divide und die damit verbundenen geringeren Nutzungskompentenzen der Digital Immigrants eine vollständige Nutzung der SNSs nicht möglich ist. Stattdessen erscheint der Aufwand für das Erlenen der Nutzung als zu groß und bei den Senioren entsteht so eine Lernblockade[45].

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[44] Welche ursprünglich auf der Definition in (Prensky, 2001, S.24) basiert.
[45] Mehr dazu in der Erklärung durch die Modelle weiter unten.

Verfolgt man in diesem Kontext die anschließende Szenarienbetrachtung, so sind im direkten Vergleich diejenigen Szenarien deutlich präferiert, die Sicherheitsbedürfnisse adressieren. Hierbei ist eine Relativierung des eingangs geäußerten Wunsches nach weiteren Kontakten zu erkennen. Der Wunsch nach weiteren Kontakten ist in einer relativen Betrachtung also als positiv eingestuft, allerdings im relativen Vergleich zu anderen Kaufanreizen signifikant weniger beeinflussend. Zusätzlich kommt der Rolle von Vertrauen eine besondere Bedeutung zu, denn sowohl die Nutzungsabsicht als auch die Kaufbereitschaft für ein entsprechendes Produkt korrelieren signifikant positiv mit dem Level an Vertrauen in die Technologie.

Bezogen auf die Leitfrage bieten diese Ergebnisse erste Indikatoren für Integrationsmöglichkeiten von Senioren in virtuellen Umgebungen. Hierbei könnten effizientere Hilfssysteme den Umgang mit den virtuellen Umgebungen vereinfachen (wie im Experiment der 6. Publikation durchgeführt). Weiterhin könnte der Relevanz von Sicherheit und Vertrauen mehr Beachtung geschenkt werden. Diese Attribute könnten in die Grundfunktionalitäten der Webseiten aufgenommen werden (z.B. durch Identitätsüberprüfung der Mitglieder, um falsche Profile zu vermeiden).

> **Zwischenergebnis**: Senioren äußern überwiegend die Motivation barrierefreier und häufiger an neue Sozialkontakte zu geraten. Dem gegenüber zeigen sie allerdings keine Handlungsimpulse, um die gebotenen Optionen im Internet wahrzunehmen. Die plausible Erklärung mangelnder Nutzerkompetenzen legt als Konsequent eine effektivere Integration von Senioren (z.B. durch verbesserte Hilfssysteme) nahe.

Um diese möglichen Ansätze in Bezug auf die Leitfrage bewerten zu können, müssen allerdings zunächst die Resultate der Marktanalyse (4. & 5. Veröffentlichung) in die Betrachtung mit einbezogen werden. Der eingehende Aufbau des Kriterienkatalogs differenziert den Funktionsumfang von virtuellen Umgebungen (mit Fokus auf SNSs) in drei Dimensionen: Sozialgemeinschaft, Forum und Inhaltsmanagementsysteme[46]. Während die letzte Kategorie eher auf Newsseiten zu finden ist, fokussieren die ersten beiden Kategorien auf den Austausch der Mitglieder untereinander.

Mit diesem Katalog zeigen die Ergebnisse der anschließenden Marktstudie, dass die bestehenden Webseiten unterschiedliche Schwerpunkte in ihren Inhalten setzen. Weiterhin zeigt die Untersuchung, dass es bei der Nutzerbewertung von Seiten nicht in erster Linie um die Vielzahl an Funktionen, sondern um deren Implementierung und Qualität geht. Da SNS mit ausgeprägter Sozialgemeinschaft und einem gut strukturierten Forum eine signifikant höhere Wiederaufrufquote aufzeigen, sind diese Funktionen der virtuellen Sozialnetzwerke offenbar Kernstück für den regelmäßigen Besuch ihrer Mitglieder.

Bezieht man diese Erkenntnisse auf die Leitfrage, so wird klar, dass eine niedrige Nachfrage der Senioren bei SNS mit ausgebauten Sozial- und Forumsfunktionen offenbar nicht an der fehlenden Nachfrage scheitert (diese ist eindeutig diagnostiziert worden), sondern an der Qualität der Funktionsimplementierung. Die Senioren schätzen in diesem Zusammenhang nicht die Quantität möglicher Funktionen, sondern deren Qualität.

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[46] Siehe hierfür die Definition von Content Management Systemen im Glossar.

Dies ist aus zweierlei Begründung eine konsistente Aussage bezüglich der eingehenden Analyse der Nutzerpräferenzen. Zum einen besitzen Digital Immigrants offenbar eine niedrigere Nutzerkompetenz bezüglich der virtuellen Umgebungen[47]. Die Anzahl der verfügbaren Funktionen eröffnet also nicht nur Möglichkeiten, sondern erhöht im Gegenzug auch die Komplexität der Nutzung. Folglich ist die Chance für eine Lernblockade durch die Quantität an Funktionen tendenziell höher. Zum anderen haben Senioren einen deutlichen Bedarf an (aus subjektiver Perspektive) Qualität der Implementierung existierender Funktionen.

Hierbei ist es sinnvoll den Qualitätsbegriff in der Analyse zu hinterfragen. Aus Sicht eines Nutzers mit einer niedrigen Nutzerkompetenz ist also davon auszugehen, dass sich die Qualität der Sozialinteraktions- und Forumsfunktionen in erster Linie durch ihre Einfachheit in der Benutzung beschreibt. Ferner gilt, dass die weiteren Präferenzen der Senioren, wie das Bedürfnis nach Sicherheit und das Vertrauen in die Technologie, Einflussfaktoren für die wahrgenommene Qualität darstellen (diese sind als Präferenzen erhoben worden).

Bezieht man nun die letzte Perspektive, nämlich das Lernverhalten der Senioren, mit ein, so wird am Beispiel der Bedienung einer virtuellen Umgebung ein weiterer Aspekt aufgezeigt. Die Senioren in der Testgruppe des Experiments zeigten deutlich höhere Lerneffekte bei der Nutzung von persönlicher Betreuung im Vergleich zu technischen Unterstützung. Die Reaktion auf die persönlichen Hilfestellungen schuf zum einen ein höheres Vertrauen in die Technologie, zum anderen wurden die gestellten Aufgaben signifikant besser gelöst.

Beantwortung der Leitfrage: Es lässt sich aufgrund der Ergebnisse schlussfolgern, dass die Integration von Senioren als Digital Immigrants in virtuellen Umgebungen unter anderem durch drei Faktoren verbessert werden kann:

- *Einfachheit der Funktionen erhöhen*

Die Quantität der Funktionen bietet keinen Anreiz für Senioren zur Nutzung von virtuellen Umgebungen. Stattdessen ist zur Einbeziehung von Senioren als Zielgruppe eine Vereinfachung der Funktionalitäten sinnvoll. Diese könnte z.B. durch eine spezielle Ansicht auf die virtuelle Umgebung generiert werden, die lediglich Basisfunktionalitäten und eine einfach zu bedienendes Nutzerschnittstelle garantieren.

- *Vertrauen und Sicherheit als Faktoren für Funktionsdesign einbeziehen*

Die Nutzergruppe der Senioren zeigt eine besondere Affinität gegenüber den Werten Sicherheit und Vertrauen. Die Integration dieser Werte in das Gesamtprodukt bzw. die Entwicklung einer SNS mit dem Fokus auf diese Werte würde die Attraktivität für die Gruppe der Senioren signifikant erhöhen.

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[47] Siehe hierfür unter anderem Foote (2008) für eine exemplarische Beschreibung von Digital Immigrants als Lehrer gegenüber Schülern, Sofka et al. (2012, S.56 ff.) für einen Überblick über Forschungsansätze bezüglich den Problemen von Digital Immigrants und den Schwierigkeiten der Kommunikation mit Digital Natives, und letztlich Burmester (2006, S.87 ff.) mit einer beispielhaften Betrachtung der Digital Immigrants im Szenario der Videospiele.

- *Persönliche Betreuung in der Nutzung der Umgebung und als Lernhilfen*

Die bestehende Differenz zwischen Bedarf an neuen Kanälen für Kontakte und Nicht-Nutzung der virtuellen Umgebungen kann nur durch eine Erhöhung der Nutzerkompetenzen von Senioren erfolgen. Diese setzen wiederum Lerneffekte voraus. Es zeigt sich, dass die Investition in persönliche Lernhilfen (persönliche Hilfe, visuelle Anleitungen, etc.) einen deutlich höheren Lerneffekt im Vergleich zu rein technischen Assistenten besitzt. Als Option für bestehende Betreiber könnte sich so z.B. ein visualisiertes Coaching-Angebot empfehlen, um diese Zielgruppe effektiver zu erreichen. Trotz der mit einer Betreuung verbundenen Kosten kann hiermit zum einen das Vertrauen und zum anderen die Nutzungskompetenz der Teilnehmer erhöht werden. Eine plausible Folgeannahme wäre, dass mit Multiplikationseffekten (Senioren trainieren andere Senioren) sowie Loyalitätseffekten (Nutzung bekannter Umgebungen aus Gewohnheit) zu rechnen ist.

Ergebnis: Eine effektivere Integration von Digital Immigrants, wie z.B. Senioren, in die virtuellen Umgebungen kann unter anderem durch drei Faktoren erreicht werden. Eine signifikante Reduktion in der Komplexität des Funktionsumfanges (z.B. durch verbesserte Benutzerführung), Schaffung von Vertrauen in Sicherheit der Technologie und letztlich einer (persönlichen) Betreuung für typische Fragestellungen. Insbesondere der letzte Punkt hat in experimentellen Kontexten zu einer signifikanten Erhöhung der Nutzungskompetenz und Akzeptanz geführt.

4.2.2. Lernmodellaussagekraft des Verhaltens der Senioren

Innerhalb des zweiten Teils des kritischen Diskurses wird die Prädiktionsfähigkeit des exemplarisch ausgewählten Lerntheorienmodells von Knud Illeris betrachtet. In dieser strukturierten Analyse werden Beobachtungen der experimentellen Umsetzung mit den Aussagen einer modellhaften Lernbeschreibung verglichen.

Bezieht man die beiden Dimensionen - interne Lernfähigkeit (Motivation, Anreiz, Lernwilligkeit) und externen Einflussfaktoren (Umwelt, Lernerfahrung, Umgebung) - mit ein, so stellt sich innerhalb des gesamten Forschungsansatzes dieser Dissertation folgendes heraus:

Senioren besitzen zwar ein klar formuliertes Bedürfnis nach einer Zunahme von Sozialkontakten und schätzen den virtuellen Kanal als eine Möglichkeit zu deren Intensivierung ein, dennoch werden bestehende Systeme nicht hinreichend bzw. überhaupt nicht genutzt. Diese Diskrepanz konnte mit Hilfe des Konzepts der Digital Immigrants erklärt werden, denn offenbar besitzt die Zielgruppe eine vergleichsweise niedrige Nutzerkompetenz bezüglich dieser Medien.

Würde in der modellhaften Erklärung nun nur eine der beiden Dimensionen verwendet werden, so würden Teile der komplexen Zusammenhänge nicht im Erklärungsbereich beinhaltet sein. Innerhalb der internen Dimension müsste ein Modell also die Fragestellung nach potentiellen

Lernbarrieren beantworten. Gleichzeitig müsste die externe Dimension eine Betrachtung der Einflussfaktoren, wie z.B. Funktionen der bestehenden virtuellen Umgebungen mit einbeziehen.

Analyse des Lernmodells: Zunächst erfüllt der betrachtete Prozess der Senioren im Experiment den Gegenstand des Lernens nach Modelldefinition. Die Teilnehmer verbesserten ihre Nutzerkompetenzen von einer spezifischen virtuellen Umgebung. Dies stellte eine dauerhafte positive Veränderung der Fähigkeiten im technologischen Nutzungsbereich dar, welches nicht auf einen genetisch-biologischen Reifeprozess zurückzuführen war. Man kann das Beispiel nach Illeris also seitens des Modells als Lernen bezeichnen.

Ferner ist die Erklärung des Lernvorgangs ebenfalls mit den Parametern des Modells erfassbar. Auf der Achse der externen Dimension existierte zwischen den Senioren des Experiments und der virtuellen Umgebung eine Interaktion. Diese beinhaltete verschiedene Aktivitäten (Aufgaben innerhalb der virtuellen Umgebung) sowie Kommunikation (entweder mit persönlichen Lernhilfen oder einem technischen Assistenten). Durch die Interaktion mit der Umwelt werden beim Senioren Lernprozesse angestoßen, dieser modellhafte Zusammenhang konnte auch im Experiment nachvollzogen werden.

Die zweite Dimension, nämlich die interne Ebene, welche im Spannungsfeld zwischen Inhalt und Anreiz des Lernens angesiedelt ist, beschreibt den subjektinternen Teil des Lernens. Die Motivationsebene (Incentive) des Modells kann anhand des Experiments plausibel nachvollzogen werden, denn die Kandidat(inn)en zeigten durch die Teilnahme bereits ein Interesse gegenüber dem Thema. Ebenfalls die inhaltliche Komponente, nämlich das Verständnis und die Fähigkeiten der Nutzung von virtuellen Umgebungen, konnten im Experiment gemessen werden.

Allerdings lässt der spezielle Umstand der Interaktion in virtuellen Umgebungen noch einige Fragestellungen offen, bei denen das Modell verfeinert werden müsste, um dem Fall gerecht zu werden.

Einer dieser Faktoren ist die Frage nach der Wahl der technologischen Mittel (z.B. technologische Realisierungsmethoden, spezielle Designelemente eines SNS, etc.). Zum einen stellen diese Elemente nach der Logik von Illeris Aspekte der Umwelt dar, sind also Teil der Wahrnehmung auf der horizontalen Achse. Zum anderen stellen sie allerdings auch direkt eine inhaltliche Komponente. Dies liegt in der Natur der virtuellen Umgebung, bei der Technologien sowohl Mittel als auch gleichzeitig Inhalte sind. Offenbar herrscht somit also eine Interaktion zwischen Umweltparametern und Inhalten, diese beeinflusst letztlich auch die Motivation der Subjekte sich mit einem SNS auseinander zu setzen.

Eine Möglichkeit dieser Dualität gerecht zu werden wäre, innerhalb der Verbindungsachse zwischen Horizontalen und Vertikalen dediziert auf deren Interkation einzugehen. Die Wahl der technologischen Mittel beeinflusst somit also nicht nur die Umweltwahrnehmung (und die damit verbundenen Erfahrungen), sondern auch die weitergehende Motivation sich mit diesen Elementen auseinander zu setzen (Motivation) und stellt letztlich den Zugang zum Inhalt dar (Anwendungswissen wie z.B. Erkenntnis von Regelmäßigkeiten im Umgang mit SNS).

Einem weiteren spezifischen Umstand bei den Ergebnissen der Untersuchung muss das Modell von Illeris gerecht werden: nämlich der Beobachtbarkeit von Lernbarrieren. Illeris schließt im Modell Lernbarrieren explizit mit ein, diese werden über die Dimension des Anreizes (fehlende bzw. negative Motivation) modelliert. Der kausale Zusammenhang zwischen mangelnden Fähigkeiten in der Benutzung der virtuellen Umgebungen des Individuums und den daraus resultierenden Reduktionen des Lernanreizes, welche im Endeffekt erst effizient durch ein persönliches Coaching aufgelöst werden konnte, ist allerdings im Spannungsfeld in dieser Detailstufe nicht hinreichend abgebildet. Das Model würde also zu einer präzisen Beschreibung eines IST-Zustandes gelangen, allerdings selbst keine Möglichkeiten der Modifikation dieses Zustandes darstellen. Eine Anpassung des Modells von Illeris in derart, dass Verläufe und Veränderungen in den einzelnen Kategorien abgebildet werden können, würden den statischen Charakter auflösen.

Dies zeigt sich u.a. in der Darstellung des Modells: Betrachtet man das Lerndreieck von Illeris (Abbildung 6), so zeigt das Modell unter der Dimension Inhalt (Content) die Fähigkeiten (Skills) und das Verständnis (Knowledge) der Person. Unter der zweiten Dimension Anreize (Incentive) sind Motivation und Emotion als Einflussfaktoren behandelt.

Eine Modifikation bezüglich der Dynamik des Modells könnte wie folgt gestaltet sein. Die Abbildung des Lernablaufes im Experiment würde beinhalten, dass die Subjekte zunächst im Ausgangszustand eine Lernbarriere besitzen. Diese verhindert eine weitere Beschäftigung mit dem Thema. Dennoch müsste ein potentielles Interesse (z.B. potentielle Motivation) hinzugefügt werden. Es macht nämlich sehr wohl einen Unterschied, ob ein Person generell kein Interesse an der Interaktion im Internet besitzt oder diese ablehnt, weil notwendige Fähigkeiten nicht vorhanden sind.

Würde eine solche Potentialkomponente beim Interesse hinzugefügt werden, so wäre sie im konkreten Beispiel der Senioren sehr viel höher als die aktuelle Motivation. In anderen Worten wünschen sich die Senioren eine Interaktion mit anderen und sind hierfür auch bereit SNS zu nutzen. Allerdings würde die aktuelle Motivation niedriger sein, weil notwendigen Fähigkeiten zur Interaktion bislang fehlen.

Die Dynamik würde dadurch entstehen, dass durch ein Training die aktuelle Motivation sich der potentiellen Motivation annähert (diese würde im Modell eine obere Schranke bilden). Durch die somit steigende Realmotivation folgt eine Auflösung der Lernbarriere, was in der Konsequenz ggf. wiederum Auswirkungen auf die Lernanreize besitzt.

Fazit: Der Bereich der Interaktion von Senioren in SNS bietet für das Modell von Illeris die Möglichkeit auf die spezifischen Umstände dieser Interaktion durch eine Modifikation einzugehen. Zum einen würde eine stärkere Fokussierung auf die Interaktion zwischen horizontaler und vertikaler Achse der Dualität der technologischen Mittel (welche sowohl Mittel zu Erstellung allerdings auch gleichzeitig Inhalte der Interaktion sind) gerecht zu werden. Zum anderen kann die Statik des bisherigen deskriptiven Models weiter angepasst werden, indem eine dynamische Komponente hinzugefügt werden würde. Diese könnte in der Form einer potentiellen Motivation (welche als obere Schranke der realen Motivation agiert) dargestellt

werden. Mithilfe der potentiellen Motivation lassen sich z.B. Auflösungen von Lernbarrieren darstellen.

4.3. Forschungslimitationen

Trotz der gewonnenen Erkenntnisse verbleiben in den einzelnen methodischen Schritten und im Rahmenwerkt Limitationen. Diese haben Einfluss auf den Aussagewert der Erkenntnisse. Mit einem Verständnis zu den bestehenden Limitationen können die Ergebnisse also in Relation gebracht werden. Tabelle 2 beinhaltet eine Übersicht (gegliedert nach Quelle) zu den Limitationen der Dissertation.

Tabelle 2: Übersicht der Forschungslimitationen der Veröffentlichungen und des Rahmenwerkes.

(eigene Darstellung)

Veröffentlichung	Limitationen
Literaturanalyse (1. Veröffentlichung) Fritsch et al. (2013)	• Auswahl der Online Datenbanken für Grundgesamtheit • Informationsselektion in den Artikeln • Nur englische Artikel gegenüber einem starken Themenfokus in Deutschland • Anzahl der Suchparameter und Kombinationen, weitere Parameter hätten höhere Differenzierung ermöglicht
Präferenzanalyse (2. Veröffentlichung) Fritsch et al. (2012)	• Repräsentativität der Befragten • Statistische Analyse (Mittelwertvergleich) repräsentiert nicht zwangsläufig Stärke des Bedarfs • Beobachtung von reinen Handlungsintentionen
Szenarienanalyse (3. Veröffentlichung) Fritsch et al. (2012a)	• Geringe Anzahl an Frageteilnehmern • Schlussfolgerungen von Szenarien auf generelle Produkte nur teilweise möglich (Anzahl beobachtbarer Faktoren) • Internetrekrutierung von Frageteilnehmern (unterrepräsentiert ältere Senioren) • Reine Fokussierung auf den deutschen Markt
Kriterienkatalog (4. Veröffentlichung) Fritsch (2012)	• Limitierte Anzahl an Experten • Offen strukturierte Fragen und ex-post Zusammensetzung Kriterienkatalog • Repräsentativität der Experten
Marktanalyse SNS (5. Veröffentlichung) Fritsch et al. (2013b)	• Kategorien zur Evaluation basierend auf Experten (keine Garantie für Vollständigkeit) • Begrenzter dreimonatiger Zeitraum der Analyse • Bewertung der Webseiten nach strukturierten Leitfäden lag bei den Autoren
Experiment (6. Veröffentlichung) Fritsch et al. (2014)	• Auswahlmethode der Rekrutierung: Aufruf in Zeitschriften mit personen-zentrierter Weiterempfehlung kann zu nicht-repräsentativer Stichprobe führen • Deutlich höhere Technologieaffinität der Testgruppe gegenüber Grundgesamtheit • Geringe Anzahl an Teilnehmern • Potentieller Antwortbias durch soziale Erwünschtheit • Fokussierung der Betrachtung auf Haushaltsapplikationen
Rahmenwerk (Gesamtansatz)	• Ungleiche Teilnehmergruppe über mehrere Studien • Thematische Fokussierung trotz weitreichendem Fehlen der Grundlagen

4.4. Zusammenfassung und Ausblick

Die vorliegende Dissertation beschäftigte sich mit der Leitfrage „*inwiefern können Senioren als Repräsentanten der Digital Immigrants effizienter in die Interaktion in virtuellen Umgebungen eingebunden werden?*". Dabei wurde zunächst die Problemsituation im Spannungsfeld eines

demographischen Wandels in Kombination mit einer zunehmenden gesellschaftlichen Virtualisierung dargelegt.

Darauffolgend ging die Arbeit auf die Begriffserläuterung im Kontext der Problemstellung ein und stellte zentrale Definitionen klar. Diese wiederum wurden verwendet, um das Forschungsrahmenwerk mit seinen vier Phasen und diversen Teilansätzen zu skizzieren und die damit verbundenen Zusammenhänge aufzuzeigen. Neben der Evaluation der Leitfrage wurde ebenfalls systematisch das Lernmodell von Illeris analysiert.

Kritischer Diskurs: Die Publikationen, die als Grundlage der Inauguraldissertation dienen, wurden samt aller relevanter Informationen und deren wissenschaftlichem Einfluss dargestellt. Ihre Hauptresultate wurden daraufhin zusammengefasst und dienten als Grundlage für die übergreifende Evaluation. Innerhalb des kritischen Diskurses wurde die eingehende Leitfrage nach einer abwägenden Analyse mit drei potentiellen Optimierungsansätzen beantwortet. So stellte dir Arbeit auf Grundlage der Ansätze fest, dass die Integration der Senioren in virtuelle Umgebungen erhöht werden kann, indem die bestehenden Funktionen einfacher gestaltet werden sollten, Vertrauen und Sicherheit als Faktoren fürs Funktionsdesign stärker in den Fokus rücken sollten und die persönliche Betreuung der Nutzer in den virtuellen Umgebungen methodisch überdacht werden sollte.

Ergebnisanwendung auf Lernmodelle: Bezogen auf die anschließende Evaluation der Lernmodelle zeigte der kritische Diskurs, dass Illeris Lernmodel strukturell die Umstände der Interkation von Senioren in SNS konsistent darstellt. Die Spezifik der virtuellen Umgebung legt es allerdings nahe, dass Anpassungen am Modell zur präziseren Gesamtdarstellung benötigt werden. Im Wesentlichen kann durch eine engere Verbindung zwischen Horizontaler und Vertikaler Achse die Dualität der technologischen Umgebung besser dargestellt werden. Zusätzlich bietet die Einführung von einer weiteren Variablen (nämlich der potentiellen Lernmotivation) die Möglichkeit aus der statischen Beschreibung des Modells eine dynamische Darstellung zu kreieren.

Bezogen auf die Leitfrage lieferte die Dissertation die eingehend dargestellten wissenschaftlichen Mehrwerte[48] und stellte gleichzeitig die damit verbundenen Forschungslimitationen[49] dar. Die ermittelten Grundlagen in der Beobachtung von Senioren in virtuellen Umgebungen helfen dabei Teile des bestehenden Erkenntnisdefizits zu schließen. Dennoch bestehen weitere Themenfelder, die in einer vertiefenden Analyse betrachtet werden könnten.

So bietet die Arbeit eine Grundlage für folgende exemplarische Forschungsvertiefungen:
- Validierung der Präferenzstrukturen unter Einbezug weiterer Faktoren (z.B. kultureller Hintergrund, Anzahl der Befragten, Vorerfahrungen, etc.)
- Erweiterung der Marktstudie bezüglich existierender Lösungen von SNS
- Erweiterung der Einbeziehung weiterer Technologien, die virtuelle Umgebungen enthalten (z.B. Vertiefungen im Bereich AAL, Location Based Services, etc.)

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[48] Siehe hierfür Kapitel 1.2.

[49] Siehe hierfür Kapitel 4.3.

- Erweiterung der experimentellen Lernumgebungen mit der Beobachtung zusätzlicher Einflussfaktoren
- Theoretisch-konzeptionelle Überarbeitung der bestehenden Lernmodelle zur Präzisierung des Erklärungsgehaltes

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6. Appendix (Veröffentlichungen)

6.1. Veröffentlichung 1

01-WORKINPROGRE
SS-IADIS_Communica

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ABSTRACT

THE USAGE OF INTERNET AND SOCIAL NETWORK SITES (SNSS) IS AN ONGOING TREND WITHIN THE 21ST CENTURY. THE PRESENT ARTICLE INVESTIGATES THE EXISTING PUBLICATIONS IN THE RESEARCH AREA OF OLDER PEOPLE AND SNSS. DUE TO FIVE EXCLUSION CRITERIA THE SYSTEMATIC LITERATURE REVIEW REVEALS 27 ARTICLES OUT OF 22 ONLINE BIBLIOGRAPHIC DATABASES WITH OVERALL 660 SEARCH OPERATIONS. OF THEM, ONLY EIGHT ARTICLES CONCENTRATE EXCLUSIVELY ON PEOPLE OVER THE AGE OF 50 YEARS AND EVEN TWO ARTICLES SOLELY ON PERSONS OVER 60 YEARS. THE ANALYSIS SHOWS THAT MORE THAN 80 PERCENT OF THE RELEVANT ARTICLES WERE PUBLISHED BETWEEN 2009 AND 2011. THE MAJORITY OF THE ARTICLES CAN BE SEEN AS FUNDAMENTAL RESEARCH. THE SAMPLE SIZE DIFFERS FROM 17 TO NEARLY 80.000 PEOPLE. TO OBTAIN GENERALIZABLE RESULTS FOR ELDERLY PERSONS' USAGE OF SNSS, FURTHER RESEARCH IS NECESSARY. ON THE ONE HAND, COMMUNICATION IN SNSS PROVIDES THE POTENTIAL OF REDUCING ISOLATION AND FEELINGS OF LONELINESS. BEYOND, DATA SECURITY, PRIVACY OR TRUST COULD BECOME AN OBSTACLE FOR THE USAGE OF SNSS.

1. KEYWORDS

LITERATURE REVIEW, ELDERLY PEOPLE, SOCIAL COMMUNITY, SNS, SOCIAL NETWORK SITES.

INTRODUCTION

The increasing success of social networks and the ongoing worldwide demographical change lead to the research question: *How many publications exist in the area of tension between older people and Social Networking Sites (SNSs), and which results were obtained for future research?*

Today's time is often referred to an era of information society, which is characterized by permanent access to information via mobile phone, handheld, television, etc. Due to the distribution of social media and Web 2.0 services in recent years, a new information channel has been created that enables creation, transmission and access to digital information and content that is posted by Internet users themselves. Thus, a large portion of the currently available information is already user-generated content (UGC) (Brandtzæg & Roibás, 2009).

The most popular applications in social media are SNSs, which experience a global boom since 2003 (Boyd & Ellison, 2007). In 2010, the SNS Facebook replaced Google as the most frequently visited website in the United States. In March 2012, Facebook was the largest SNS with a total of 901 million monthly active users worldwide (Facebook Inc., 2012). Although, nowadays more older people use the Internet (Eurostat, 2011), SNSs are still communication channels, which are mainly used by 'digital natives' (Prensky, 2001; Smith, 2010). Digital natives are characterized by the facts that they are born after 1980 in the western industrialized nations and speak the digital language. Internet, mail and computer games are inherent part of their daily life. In contrast, people, who are born before 1980, are known as 'digital immigrants'. They need to learn the usage of new technologies in older age with major effort. This creates a digital gap between digital immigrants and digital natives, as for digital immigrants it is not possible to gain the same capabilities as it is for native speakers (Prensky, 2001). With increasing age it is more difficult to solve certain tasks on the Internet. Often older people need more time for the tasks or cannot achieve a solution (Hargittai, 2002).

Because of the demographic change the world population is demonstrably getting older and therefore the consideration of digital immigrants is gaining importance (UNDESA, 2010). Non-usage of SNSs increases the risk for a large proportion of older people to be excluded from the growing complex information society (Brandtzæg & Roibás, 2009). Private and public offers are increasingly available in electronic form. Communication, economic transactions, political decision-making processes and volition are shifting more and more to the digital world. Due to the shift from industrial to knowledge society, the economic and social importance of access to information rises substantially. Successes in professional careers as well as participation in recreational activities presume the competent usage of new media. As a result, the risk of personal isolation occurs for digital immigrants due to decreased participation in social and economic life (Deutscher Bundestag, 2002). Moreover, the adoption of Enterprise 2.0 applications in firms leads to growing differences between digital natives and digital immigrants in professional life.

The present study is structured as follows: The background section comprises the characteristics of older people in the information age and gives a deeper understanding of Social Networking Sites and its importance for the elderly. The literature review as research methodology is described in the third section. In the fourth section, the results of the quantitative analysis are presented. Following, a discussion of the received results is performed and an insight into further research activities is given. Finally, the limitations of the present study are demonstrated.

Background

2.1 CHARACTERISTICS OF OLDER PEOPLE IN THE INFORMATION AGE

In addition to the gradual digitalization of the society another development, which could change life in our society, is observed: the population is getting older (UNDESA, 2010). Initially, it should be mentioned that age cannot be unambiguously defined. Although the chronological age of two persons is equal, the biological, psychological or social age may differ (Stuart-Hamilton, 1994; WHO, 2011). Also the cohort shift may influence differences in persons' age. Due to this fact "there is no United Nations [UN] standard numerical criterion, but the UN agreed cutoff is 60+ years to refer to the older population" (WHO, 2011). Therefore, the relevant target group in this study are persons over the age of 60 years. In the context of new media these people belong to the so called 'digital immigrants', which have not grown up with new technologies in contrast to the 'digital natives' (Prensky, 2001).

In 2009 the proportion of older people in the more developed regions amounts to more than 20 percent. With 2.6 percent the annual growth rate is more than twice as high as the growth rate of the total population, which is 1.2 percent. According to calculations, the number of older people will triple within 40 years from 700 million people in 2009 to around 2 billion in 2050. This signifies almost a third of the total population (UNDESA, 2010). These figures underline the importance of addressing the target group 60+ years in scientific research.

2.2 SNS IN CONTEXT OF SOCIAL MEDIA

Social Media is defined as: *"[…] a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content."* (Haenlein & Kaplan, 2010). To the definition of social media, it is necessary to explain the terms Web 2.0 and user generated content in advance.

Since 2004, the term Web 2.0 is used as a new form of Internet usage. The Internet serves as a platform on which content and applications are created and published by all users in a participatory and collaborative way and no longer by individuals. This new form of Internet usage is the technical and ideological basis of social media. User-generated content (UGC) is an umbrella term, used by many people, for all forms of social media (eg. text, video, photos) (Haenlein & Kaplan, 2010).

SNSs are one type of Social Media and are defined as: *"web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system. The nature and nomenclature of these connections may vary from site to site"* (Boyd and Ellison 2007).

SNSs have their beginnings in the '90s with the cross-linking of various online diaries to a common 'Open Diary' by Susan and Bruce Abelson (Kaplan & Haenlein, 2010). In 1997 the first official SNS was followed by 'SixDegrees.com' (Boyd & Ellison, 2007).

[Boyd and Ellison 2007] clarify, that the majority of SNSs are originated from 1999 onwards. The technological developments as high-speed Internet and hardware, tablets or handhelds, are available for the mass. In combination with economic factors, which provide the tools for creating UGC, as well as social causes, such as the emergence of a generation that grew up with the Internet, the boom of SNSs starts in 2003 (Kaplan & Haenlein, 2010; Boyd & Ellison, 2007). According to Karahasanovic et al. (2009) only a small number of older persons are active on SNSs and use this new form of online participation in contrast to younger people.

The research literature referred to this as the digital divide between the generations and could also be demonstrated in several studies (Kiel, 2005; DiMaggio et al., 2004; Cothey, 2002; Loges & Jung, 2001). In digital divide, a distinction is made between the first level digital divide and the second level digital divide. The first digital divide can be justified by the variation in access to the Internet or to computers in general (Korupp & Szydlik, 2005). Older people are less likely to have an Internet ready device and therefore, have less access to the Internet (Loges & Jung, 2001). The second level digital divide describes user profiles of new technologies, differences in people online skills and Internet usage intention (Korupp & Szydlik, 2005; Hargittai, 2002).

The Internet and SNS user numbers prove the variation between the generations. In 2011, 94 percent of the 18- to 29-year-old, 87 percent of the 30- to 49-year-old, 74 percent of the 50- to 64-year-old and just 41 percent of the over 65-year-old in the USA used the Internet. This can also be illustrated by current Facebook user numbers. In March 2012, Facebook recorded about 901 million monthly active users worldwide (Facebook Inc., 2012). Around 156 million users of those come from the USA (Socialbakers.com, 2012). 14.2 percent of the users are older than 54 years (Socialbakers.com, 2012) with this age group representing 24.9 percent of the American population (U.S. Census Bureau, 2010). By comparison, the 25- to 34-year-old make up 23.4 percent of the Facebook users in the USA (Socialbakers.com, 2012) but just represent around 13.3 percent of the population of the USA (U.S. Census Bureau, 2010). Another example is the UK where about 30 million inhabitants use Facebook. The proportion of over 54-year-old users reaches 10.2 percent, where their percentage of the total population is 20.5 percent in 2010. In contrast to that 13 percent of the citizens between 25 and 34 years represent 25.4 percent of the Facebook users in the UK. The situation in Germany reflects a similar trend. Around 24 million people use Facebook. The percentage of over 54-year-old users lies at 5.7 percent and the share of 25- to 34-year-old users stands at 26.8 percent with a population distribution of 33 percent or 12 percent in 2010 (Statistisches Bundesamt, 2009).

Additionally, there exists little knowledge about older people and their needs in relation to participation in SNSs (Karahasanovic et al., 2009). Nevertheless, critics note that recent research neglects older persons in the topic of SNSs (Brandtzæg & Roibás, 2009).

Methodology

A structured literature review was performed to disclose the relevant articles in connection of SNSs and older people. The methodology enabled a systematic overview about quantitative as well as qualitative information in this field of research. Primary, the identification of relevant articles was carried out. By means of computerized search on the platforms 'Web of Science' (ThomsonReuters, 2011) and 'EBSCOhost' (Ebscohost, 2011) 22 different online bibliographic databases were used in total[1]. The overall database research was realized starting in April 2011 up to its publication in May 2011. The database searches were carried out with a filter. In the database 'Web of Science' the key search terms were filtered by a topic and in the 'EBSCOhost' by subject terms.

The key search terms, which were used in the research, were divided into two descriptors to structure the interplay between terms of social communities and elderly people. The first descriptor, called *'Platform'* contained the keywords *Online Social Network/ Community*, *Social Community* as well as *Social Networking Site*. Additionally, the shortcut SNS was integrated. The second descriptor *'Population'* comprised the used terms for people over the age of 60 years. The keywords *aging*, *adult* and *digital immigrants* as well as the stated terms and derivates of words *elder* and *old* have been taken into account (Table 1).

TABLE 1. KEY SEARCH TERMS

Platform	Population
Online Social Network	Adult
Online Social Community	Age*
Social Community Site	Digital Immigrant
Social Network Site	Elder*
Social Networking Site	Old*
SNS	

Note: *Search included stated terms and derivates (e.g. elder; elders; elderly).

Summarized, 30 different search term combinations were performed over 22 databases which signify in the aggregate 660 search procedures. Both descriptors were interrogated alternatively, beginning with the search term combination *Online Social Network* and *Adult*. Afterwards, the term Online Social Network was requested with the term 'age' and with the other search terms of the descriptor *'Population'*. In a second step, the further key

search terms of the descriptor *'Platform'*, beginning with *Online Social Community* were combined with those from the second category. Due to the large number of potentially relevant articles, the abstracts of the search results were partly analyzed during the database research. A set of *exclusion criteria* was composed for obtaining consistent results. For inclusion in the final literature analysis articles had to comply with the following criteria:

(a) The paper described explicitly the relation between SNSs and the participation of older people

(b) The study was published in a journal or presented on an international conference

(c) Articles which were first presented on a conference and afterwards published with identical findings as a journal article were only taken into consideration with the journal release

(d) The publication was written in English

(e) Due to the database research date, articles are included until end of May 2011.

During the review a data form was used to remove the important information for each relevant article. The data sheet was subdivided into various columns. First, the study details Summarized, 30 different search term combinations were performed over 22 databases which signify in the aggregate 660 search procedures (author, title, year, journal type and name or conference paper and follow-up study status) were integrated. Furthermore, the keywords of each article were listed. Moreover, the data sheet included a distinction between conceptual and empirical/experimental articles with a detailed description of the used quantitative or qualitative methodology (e.g. experiment, qualitative interview or framework development). Furthermore, a detailed listing of the measurement was written. *Participant information number*, *age* or *age group*, as well as *gender* were listed likewise. Finally, the findings of the diverse articles are noted. Keywords, bullet points and full-text are used for the data documentation. After integrating and clustering the data on the fact sheet, a detailed analysis of the relevant studies was performed.

4. Results
4.1 QUANTITATIVE DATA ANALYSIS

Based on the initial key term search with a total of 660 search procedures within the online bibliographic databases, 4.860 potentially relevant articles were detected. Based on the initial finding, the exclusion criteria have been applied to each of these relevant articles. As a methodological approach for this exclusion, the abstracts of the potential studies were reviewed. After the first exclusion phase, an overall number of 68 studies remained as potentially relevant matches for this research. Articles that focus on another age bracket and did not cause a reference on the age or did not meet the scientific requirements (magazine and newspaper articles, partly transcripts of television or radio interviews – especially concerning articles found on EBSCO) as well as articles that did not cover Social Networking Sites or Communities but social networking and communities in real life, were excluded. In addition, articles that refer to SNS in terms of an abbreviation for Sacral Nerve Stimulation, Somatic Nervous System, Sympathetic nervous system and Spallation Neutron Source were excluded as well.

27 articles included into the literature analysis	
	41 articles (60.3%) rejected based on exclusion criteria
68 articles retrieved for full text review	
	4.792 articles (98.6%) excluded based on analyzing titles and/ or
4.860 articles found as search results in online	
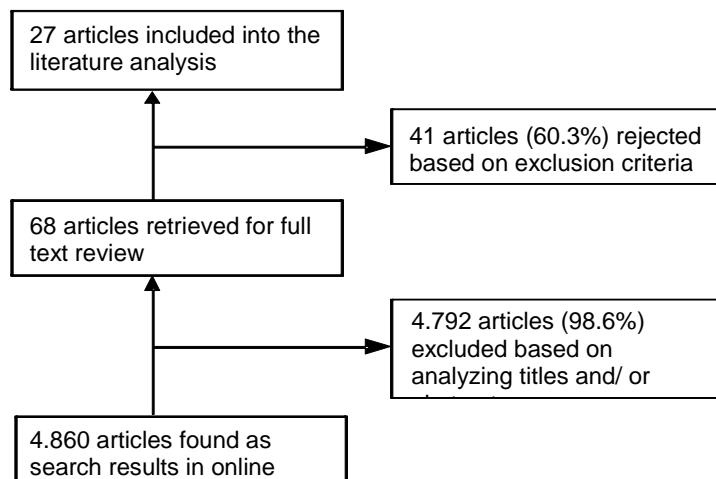
Figure 1. Literature research sequence diagram

Based on the five different exclusion criteria shown above, 41 articles (60.3 percent) were further excluded after the full-text review. A large portion of these studies (32 articles) was not relevant due to its disjunctive topic focus after reading the complete article. The articles did not analyze the relevant age groups. Furthermore, six studies were eliminated since they were not published at a conference or in a journal, due to its missing scientific contribution. Finally, the last three articles were excluded due to duplicative publications in journals and proceedings of conferences. These studies are only considered once with a more recent journal article in our results. The rigid exclusion criteria ensured the topic

focus on relevant research for this specific field of interest. In the end, 27 relevant articles were analyzed in detail in this literature review (Figure 1).

TABLE 2. OVERVIEW ABOUT THE 27 ARTICLES INTEGRATED INTO THE LITERATURE REVIEW

Author	Year	Participants Number	Age Group	Research category
Bateman, Pike, and Butler	2011	54	multiple	Survey
Chang and Zhu	2011	278	multiple	Experiment
Etchemendy et al.	2011	17	50+	Experiment
Hanson	2011	-	-	Metaanalysis
Margaryan, Littlejohn and Vojt	2011	160	multiple	Survey
Yoon, Yoon and George	2011	126	50+	Exploratory study
Chung, Park, Wang, Fulk and McLaughlin	2010	248	multiple	Survey
Ji, Choi, Lee, Han, Kim and Lee	2010	-	-	Metaanalysis
Kontos, Emmons, Puleoc and Viswanath	2010	3031	multiple	Exploratory study
Ordonez, Yassuda, and Cachioni	2010	42	60+	Experiment
Rivera-Nivar and Pomales-Garcia	2010	64	multiple	Experiment
Slajan, Schönwetter and Cleghorn	2010	52	multiple	Experiment
Wang and Wellman	2010	1178	multiple	Survey
Arazi	2009	-	-	Metaanalysis
Blaschke, Freddolino and Mullen	2009	-	-	Metaanalysis
Chou, Hunt, Beckjord, Moser and Hesse	2009	7644	multiple	Survey
Karahasanovic et al.	2009	767	multiple	Survey
Nimrod	2009	79.665	50+	Exploratory study
Pfeil, Arjan and Zaphiris	2009	100	multiple	Exploratory study
Pfeil and Zaphiris	2009	47	50+	Exploratory study
Pfeil, Zaphiris and Wilson	2009	31	50+	Survey
Sum, Methews, Pourghasem and Hughes	2009	222	50+	Survey
Wong, Fung, Law, Lam and Lee	2009	2511	multiple	Survey
Russel, Campbell and Hughes	2008	154	50+	Survey
Xie	2008	33	50+	Survey
Kanayama	2003	120	60+	Exploratory study
Butler	2001	not mentioned	multiple	Experiment

After structuring these articles and including them into a structured fact-sheet, an in-depth analysis was undertaken. Based on the first definition of SNSs and the occurrence of digital natives / immigrants in the year 2001 (Prensky, 2001), the distribution of the related research articles clearly underlines a switching focus towards the target group of digital immigrants in social media within the last two years. Hence, the publication distribution shows that the vast majority of the relevant articles were published within this time period. Figure 2 illustrates the distribution. Focusing on the period between 2009 and 2011, more than 80 percent of the relevant articles were published in this period of time.
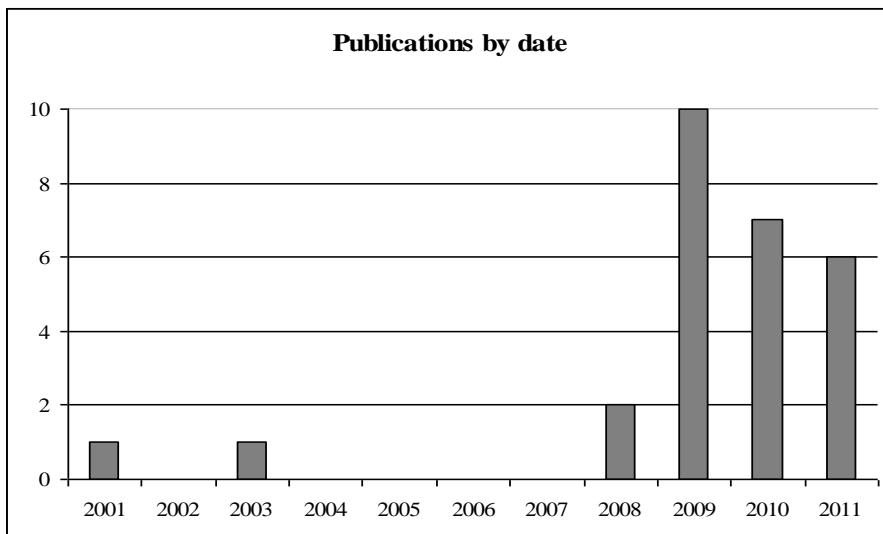
Figure 2. Distribution of the publications by publication date

Due to the analyzed articles, three different age groups can be clustered. In contrast to the initial assumption that most studies feature an older target group for their studies, the literature review indicates a counter-intuitive finding. 13 articles considered a multiple age group which includes on the one hand younger and on the other hand older people over the age of 50 years. Eight articles regarded the target group 50+ years, while only two articles concentrate on people over the age of 60 years. Additionally, the four meta-analyses are structured without age consideration. Figure 3 visualizes this distribution.
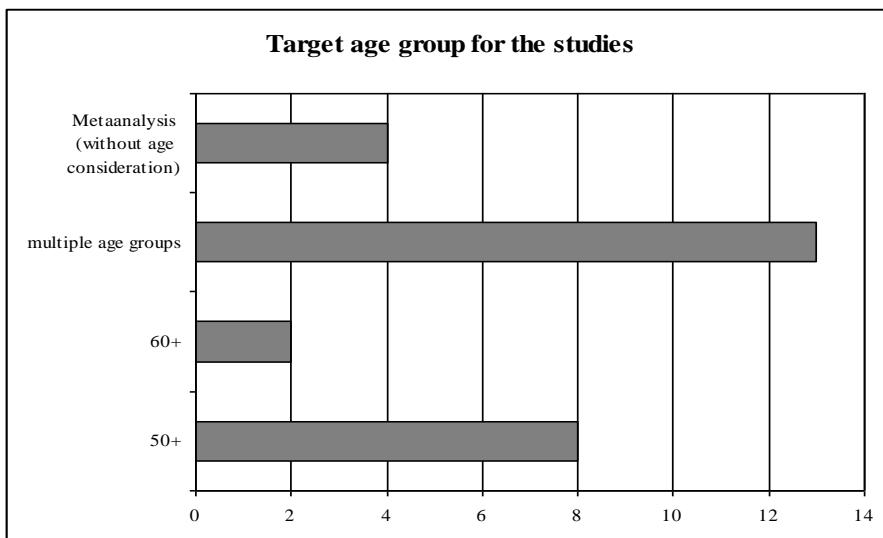
Figure 3. Distribution of the publications by age-groups

In a next step, the 27 articles were differentiated in research type categories. 11 articles cover surveys such as online studies through questionnaire as well as offline studies (telephone interviews, face-to-face interviews). Six articles performed experiments and other six can be seen as exploratory studies. Furthermore, as stated previously, four meta-analyses are included within the literature review. The clear focus towards explorative studies, experiments and surveys indicates that most of the underlying research can be perceived as fundamental research. Initial questions about the motivation and the behavioral impact of the social communities on digital immigrants are analyzed through data collecting research approaches. Interestingly, many of these articles use a combined methodology to underline or verify their results. Typical combinations of synergizing research methodology are used to provide most reliable data (such as combining questionnaires with follow-up interviews).

Finally, the differentiation along the number of observations in each of the studies gives an overview about the various quantitative and the qualitative approaches. Nimrod (2009) interrogated in total 79.665 people over the age of 50 years and has consequently the largest number of participants in the investigation (Nimrod, 2009). In contrast, Etchemendy et al. (2011) examined 17 people between 58 and 79 years in an e-health platform experiment. Due to the different survey methods and experimental setups, there exists a large standard deviation (Etchemendy et al., 2011). A total of five studies examined up to 50 participants, three trials included 51 to 100 persons, eight articles reported 101 to 500 participants, five studies included 501 to 10.000 and one study up to 80.0000 persons.

4.2 QUALITATIVE DATA ANALYSIS

After an evaluation of the statistical results the main qualitative findings within the articles can be highlighted. Increased possibilities of communication due to the extension of Internet use support people of all ages to reduce feelings of loneliness and isolation (Cole & Robinson, 2002; Katz et al., 2001). An easy operability of communication may lead to the usage of SNSs and thus to a possibility of creating and sustaining social capital (Russell et al., 2008). Based on the prior argumentation, several of the studies indicate that the easy accessibility and the aligned success in communication with others is one main driver for active participation. Especially for older adults' active participation in online communities may increase life quality, well-being and satisfaction (Etchemendy et al., 2011; Nimrod, 2009). Experience and frequency of using the Internet and living environment are factors which influence the general importance of online communities (Sum et al., 2009). Sum et al. (2009) revealed furthermore a positive connection between older adults' sense of belonging to an online community, importance of community and well-being. The type of empathic communication allows statements about the connection within social networks (Pfeil & Zaphiris, 2009). Moreover, different aspects of online social support affect older

adults' motivation of using online platforms (Pfeil et al., 2009; Xie, 2008). In this context, the perceived trustfulness of the social network is a vital factor to overcome the initial resistance for participation (Bowker & Tuffin, 2003).

The integration of older people in the digital world can support their intellectual activities. As soon as the participant can use the computer independently, the value of an SNS increases. Ordonez et al. (2010) revealed that a workshop for people over the age of 60 years to introduce Internet and usage of online communication simultaneously improves their cognitive language and memory skills. Additionally, the content of the senior platform is important for usage. Yoon et al. (2011) identified that there are almost no topic preferences due to the age. Individual occupation and income, gender as well as experience in Internet usage influence the preferred topics within SNSs (Yoon et al., 2011). Finally, several of the articles underlined the relevance of data security and privacy as important aspect for initial usage of SNSs (Bateman et al., 2010; Chung et al., 2010; Ji et al., 2010).

Conclusion

Due to the technological progress and the increasing importance of the Internet, the demand for additional online communication channels of older people is growing. Personal well-being as well as the reducing and the obviating of isolation reinforce the sense of SNSs for older persons. This study described a quantitative and qualitative literature review approach for elderly in online social networks. Therefore, the underlying problem field was addressed. Based on the background information, the leading research question for our approach was *How many publications exist in the area of tension between older people and Social Networking Sites (SNSs), and which results were obtained for future research?*. In order to provide the necessary information, two platforms within total of 22 different online bibliographic databases are used. Out of the initial 4.860 articles, only 27 articles in this specific topic were left out, which acted as the set of articles integrated in the review.

The findings for these articles underlined the rising attractiveness of this topic within the last three years. Nearly all relevant publications were published between 2009 and 2011. Regarding the target group, only ten out of 27 articles investigated solely people over the age of 50 years. The methodological focus shows the current need for background information whereas the older adults have to be more integrated in the research. As a result, it should be mentioned that only two of the six experiments are performed exclusively with older adults. Due to the different research categories, the number of participants differs from 17 people in an experiment (Etchemendy et al., 2011) to nearly 80.000 in an exploratory study (Nimrod, 2009).

Summarized it can be highlighted that the success factors for SNSs for older people are not considered near sufficient in the literature. Importance of operability as well as the understanding and willingness of older people to interact within SNSs are detected as important factors. Beyond, variables as trust in new technologies and confidence in the correct handling of personal data has to be analyzed in more detail.

Based on the insights from our research, further follow-up questions need to be addressed. In the next step, we will therefore focus on the underlying factors for a successful social network design with the specific target group of elderly people. Methodologically, this will require a standardized questionnaire with in-depth interviews. The results also need to be compared to similar findings for digital natives in order to highlight differences. Moreover, the existing German speaking SNSs will be investigated and special design requirements analyzed. Finally, based on these results a prototype for an experimental environment can be created.

Limitations

During the structuring of the systematic review some limitations in the research process have been encountered. First, the selection of online databases: While the topic of social networks and digital natives provides sufficient research material, the interrelation between elderly people and these aspects is rare. The articles were distributed in completely different journals wherefore the usage of 22 bibliographic databases should cover the studies best possible. Second, the information provided in the articles: Due to the current state of the research in this field, many of the articles are either working status or overall trend analysis. Since both of these types do not offer a scientific contribution (in terms of new information or research approaches), many of the articles were excluded from the review. Third, due to the fact, that only English language articles were included into the review, a distorted picture is drawn. The topic of elderly people has a strong focus within Germany, especially in the social science. Further implications about possible motivational factors were not considered in this review due to the prior language focus. Fourth, an expansion of the used key search terms, for example with a third descriptor, would cause additional articles in the first bibliographic database search.

Notes

[1]The platform EBSCOhost (Ebscohost 2011) includes the following 21 databases: Business Monitor Online; Business Source Premier; EconLit; Emerald; informaworld; INFORMS PubsOnline; JSTOR; Kluwer Law International; MIT Press Journals; Oxford Journals Online; Palgrave Macmillan Journals; Passport Global Market Information Database; Periodicals Archive Online; PsycARTICLES; Psychology and Behavioral Sciences Collection; PsycINFO; Regional Business News; ScienceDirect; SpringerLink; University of Chicago Press; Wiley Journals.

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6.2.   Veröffentlichung 2

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Analysis of Elderly Persons' Social Network: Need for an Appropriate Online Platform

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Abstract

THE INCREASING DEMOGRAPHIC CHANGE AND THE UPCOMING TECHNOLOGY AFFINITY OF THE ELDERLY POPULATION PROVIDE MANY INTERNET-BASED OPPORTUNITIES FOR SOCIAL INTERCONNECTION. THUS, WE FOCUS ON THE STATUS QUO OF SOCIAL CONTACTS, THE USE OF THE INTERNET AS WELL AS ONLINE INFORMATION OFFERINGS AND SUPPORT IN THE NEIGHBORHOOD FOR THE TARGET GROUP (AGE OF 60 TO 90). HENCE, TWO PARTIAL STANDARDIZED SURVEYS INCLUDING 37 AND 50 PARTICIPANTS WITH AVERAGE AGES OF 68 AND 71 YEARS WERE CONDUCTED RESPECTIVELY. RESULTS INDICATE THAT SOCIAL CONTACTS DECREASE WITH AGE AND 75 PER CENT OF THE SENIORS ALREADY USE THE INTERNET. THIS IS WHY THERE IS A GENERAL HIGH IMPORTANCE OF WEB-BASED INFORMATION OFFERINGS. BY CONTRAST, ONLY LIMITED DESIRE FOR ONLINE SUPPORT IN THE NEIGHBORHOOD EXISTS.

Introduction

Social interaction is an innermost human need at any age. However, especially elderly people often have to suffer in isolation. Because of geographical distance or lack of time, family and relatives do not have enough time to care for their loved ones. In addition, the closest of friends is getting smaller with increasing age. Then, even if the partner dies prematurely, it lacks the elderly to increase social reference persons. Due to the global demographic changes, the situation in the coming decades will increasingly exacerbate.

The internet is one way to make the existing social contacts more accessible for older people (Kaplan, Haenlein 2010). Due to the increasing use of the Internet, by now also in the target group of people over 60 years almost in Germany 60 percent are online (Initiative D21 2011). This rising number of elderly people on the Internet offers potential for social exchange platforms. According to the study by ACTA (2010), the membership in Social Network Sites (SNS) has also grown. Whereas in 2009 only seven percent of people aged 40 to 49 and three percent in the age between 50 and 64 were active people in social networks, the number rose in 2010 to 20 percent (age 40 to 49) and 10 percent (age 50 to 64) (ACTA 2010). An impressive example is the SNS Facebook, which now has over 750 million users (Facebook 2011).

The current research approach is based on the prior literature review by Fritsch et al. (2011). One of the identified research gaps is the need to integrate elderly people into information technology usage. The urgency is underlined due to the fact that more than 80% of the topic relevant papers have been published within the last three years. Based on the findings of the literature review, this paper contains an empirical approach to tackle the motivation to interact with information technology devices (specifically elderly people). In the following, the growth potential of SNS for elderly persons will be analyzed by aim of face-to-face interviews.

The reminder of this paper structures as follows: The background section contains a brief overview about the two major trends in this context: rise of the information technology and demographical change. The methodological section includes a detailed description about the empirical research approach, including the sampling, measuring and evaluation mechanisms. The analysis section features a statistical approach including various statistical approaches. Whereas the discussion section picks up the most important findings and interprets them with regard to the leading research question. Finally, the conclusion section highlights the most significant findings and gives an overview about the follow-up approach of this paper.

Background

Two major trends of today are the rapid growth of the information technology as well as the demographic change within the overall society (de Ruyter et al. 2010). Both of these megatrends penetrate several other functional areas of the society and are thus responsible for a fundamental change (Eberhard et al. 2010). Furthermore, both of these trends show strong interrelations with each other. Focus groups of young users are already well connected, meanwhile other target groups, such as the elderly largely remain out of the sphere of interest so far (Karahasanovic et al. 2009; Prensky 2001).

The rise of the information technology: The usage of the information technology, including the Internet, has dramatically increased over the last decade. On par with this increase, several further trends emerged, such as the revolution of user-generated content (Brandtzæg, Roibás 2009) and the spread of social network communities (Boyd, Ellison 2007; Studer 2009). These trends show the evolution path of the virtual environment, whereas the huge innovation of information technology influences nearly every functional area within the society. Based on the functional differentiation of the society by Luhmann (1994), the information technology would account as a part of the mass media sector.

By doing so, it does expand the current function of information provision by further aspects, such as availability and just-in-time communication (e.g. Internet shopping as an alternative for real shopping). Although this change increases the efficiency of these processes, it does discriminate a large part of the society (Brandtzæg, Roibás 2009). Users who are not capable of interacting with the new technological interfaces either need to stick to classic channels (e.g. buying in a real shop) or rely on the help of others to provide them with help.

Demographical change: As a parallel, interdependent evolution, the population is becoming older on average (Georgieff 2008; Tews 1996; UNDESA 2010). With regard to the interface of information technology services, older people are less likely to adopt them (Karahasanovic et al. 2009; Smith 2010). Evidence for this significant gap can be found in the distribution of mobile phones (De.statista.com; Google et al. 2010) or the demographic distribution in the usage of Facebook (Instrategylabs.com 2010). Both cases underline that elderly people on average show significantly less usage of these channels (Smith 2010). Combined with the aspect of discrimination, the knowledge gap and need for help and the reduction of real-world opportunities lead to a decrease in the quality of life.

Bringing both trends together: Therefore, this paper focuses on the motivation of the elderly to interact with technology. The aim is to provide an overview about the existing obstacles and purpose solutions for an integration of elderly people into the virtual environments.

Methods

Background Information

The analysis was based on data collected in two semi-structured face-to-face interviews with overall 87 participants in Berlin, Germany. The first survey (37 attendees) was conducted between January and February 2011, the second one (50 attendees) between February and March 2011. Both surveys' lengths were between 1.5 hours and 3.0 hours. As the study rests upon both surveys, comparability regarding target groups had to be ensured. Hence, the background characteristics age, gender, current job and housing situation were ascertained in both surveys. As shown below, background characteristics only differ barely, so that homogeneous target groups can be assumed.

Participants of the first interview were between 58 and 89 years old and their average age was 68.76 years with a standard deviation of 7.57 years. The majority of 62.2 per cent (23 persons) was female, a minority of 14 elderly (37.8 per cent) was male. 23 seniors (67.6 per cent) had already retired and 11 (32.4 per cent) still had a job (whereas three did not respond to this question). Regarding housing situation, the sample was split. 19 persons (51.4 per cent) stated to live alone versus 18 (48.6 per cent) who lived together with someone else.

In the second survey, the minimum (60 years) and maximum (90 years) age of attendees was similar to the first one and the average age of all attendees was 71.26 years with a standard deviation of 7.38 years. Again, more women (72 per cent or 36 persons) participated than men (28 percent or 14 persons) and 86 per cent (or 43 persons) of the elderly had already retired (versus 7 persons or 14 per cent who had not. 54 per cent (27 persons) stated to live in a single household versus 46 per cent (23 persons) who lived with someone else.

Questionnaire development

At the first step, the status quo of social contacts of the elderly population in Germany was examined in the first interview with its focus on individuals. Participants were questioned about their overall contacts per week as well as their contacts to family members and friends personally or via telephone. In addition, they were asked about their relationships to their contact persons, frequencies of interaction per week, satisfaction as well as their general desires for more frequent direct interactions with their five closest reference persons. To verify these results, respondents indicated if they would like to see or interact with others (here family members and friends) more often and if there is a wish to simplify making contacts.

Based on the results of the first study, the second interview with its focus on technology explored the user behavior of the elderly respecting the internet and examined different options of access to information offerings at the second step. The objective was to cover options to support seniors in gaining more social participation. Therefore, respondents were questioned about having access to the internet (if yes how long) as well as its importance. Regarding options of access to information offering, attendees evaluated its general importance and its importance with a focus on the elderly, the importance of listing of events as well as the importance of listing business hours nearby (both at a glance). Lastly, participants were interviewed on the importance and specific possibilities of support in their neighborhoods. For this analysis, the following variables were examined: Importance of commitment and enhancement, importance of support for commitment and enhancement, importance to supply small services, importance of information for sports offerings.

Statistical analysis

In the first interview, no consistent way could be applied to assess the different variables. All values examining the amount of contacts to others as well as the frequencies of interactions with them were based on open metric scales. The relationship to other contacts was coded as "family" and "non-family", with values of 1 and 0. It is the same with satisfaction, which is coded as "desire for less contact" (-1), "same contact as yet" (0) and "wish for more contact" (1). In consideration of the desire for more frequent interactions with the five closest reference persons, value 1 means "more often" and 0 the "same as yet". Analogous, in case of the differentiation between "family members" and "friends", values of 1 and 0 were applied. Lastly, the wish to simplify making contacts was coded as "yes" and "no", with values of 1 and 0. In the second interview, the amount of years having access to the internet was based on an open metric scale and every importance factor was measured with a single question on a 10 point Likert scale. In order to avoid forged results, all outlier of questions based on open metric scales were identified through box plot analyses and eliminated

subsequently. The criterion for an outlier was defined as a score that is more than 1.5 box lengths away from the upper or lower edge of the box which represents all values between the 25th and 75th percentile (Backhaus et al. 2006).

To obtain sound results, descriptive analyses of all gathered figures were conducted. In addition, t-tests were used to compare the amount of contacts per week to the five closest reference persons between the distinctions of contacts (contacts to family versus contacts to non-family) as well as the distinctions of satisfaction (satisfaction with family versus satisfaction with non-family). Furthermore, correlations were used to investigate nexuses between the different desires of the elderly for information offerings. Lastly, another correlation analysis was conducted to study interrelationships among the different importance factors for support in the neighborhood. All statistical analyses were conducted using PAWS SPSS Statistics v.17.

Results

Social contacts of the elderly

At large, seniors reported 24.77 contacts per week on average. Concerning the distribution, there are vast differences. Only 1.40 (personal) and 3.24 (via telephone) of them account for contacts with family members. As opposed to this, personal contacts with friends are more than twice as much (3.17), whereas contacts via telephone (3.45) are only slightly more (see table 1). Concerning age and social contacts, a significant nexus can be proven with respondents' contacts per week. A correlation factor of -0.36

0.16) (see table 2). This is also consistent with the gathered figure of 38 per cent to see others more often and 45 per cent for the desire of more frequent direct interactions. In addition, a majority of 58 per cent would like to simplify making contacts.

Attention should be paid to the fact that the relationship (family versus non-family) to one of the five closest reference persons has a significant influence on the satisfaction (except reference person 1). A t-test analysis for unpaired comparisons shows that satisfaction scores of relationships with family members are essentially higher than those with others (see table 3). This is an interesting fact as it can be assumed that the frequency of interactions with relatives is slightly less (whereas only the value of reference person 2 is significant). Hence, this means that the elderly would like to have more contacts with non-family members (e.g. their friends or club members although they already interact with them more often – except for the closest reference person.

Table 2

Contacts per week, satisfaction with and relationship to the five closest reference persons

		Reference person 1	Reference person 2	Reference person 3
Contacts per week	N	32	31	27
	Mean	3.45	2.21	1.58
	StD	2.49	2.02	1.51
Satisfactio	N	37	37	35

(significance level of 0.043) shows that social contacts per week decrease with age.

Table 1

Descriptive statistics (participants, mean, standard deviation) of different kinds of contacts

	Contacts per week	Family (personally)	Family (via phone)
N	33	33	33
Mean	24.77	1.39	3.24
StD	18.86	1.44	2.59
	Friends (personally)	Friends (via phone)	Other
N	31	31	31
Mean	3.17	3.45	13.52
StD	3.93	3.17	12.46

In view of participants' relationships with their reference persons, there is a clear distinction between the first and the second one as well as the rest. Whereas 51 per cent of the first and 54 per cent of the second reference persons are family members, this number drops to 29 per cent (third), 31 per cent (fourth) and 30 per cent (fifth) respectively. Regarding overall contacts, the quantity decreases from reference person 1 (closest one) to 4, but increases slightly with reference person 5 (see table 2).

In terms of satisfaction, numbers differ barely and are close to zero. On average, seniors seem to be most pleased with their relationship to reference person 1 (0.05) and 3 (0.06) and wish some more contact to the rest (values of 0.11 and

n with	Mean	0.05	0.16	0.06
	StD	0.40	0.44	0.24
Relation-ship to	Family	51.4%	54.1%	28.6%
	Non-family	48.6%	45.9%	71.4%
		Reference person 4	Reference person 5	
Contacts per week	N	30	26	
	Mean	1.28	2.21	
	StD	1.15	2.29	
Satisfaction with	N	35	27	
	Mean	0.11	0.11	
	StD	0.40	0.42	
Relation-ship to	Family	31.4%	29.6%	
	Non-family	68.6%	70.4%	

Table 3
Mean of contacts to and satisfaction with reference persons 1 to 5 in view of the difference of relationship (t-test for unpaired comparisons)

	Reference person 1			Reference person 2		
	N	Mean	p-value	N	Mean	p-value
Contacts to family	16	3.45		16	1.63	
Contacts to non-family	16	3.44	0.737	15	2.83	0.023
Satisfaction family	19	0.05		20	0.30	
Satisfaction non-family	18	0.06	0.929	17	0.00	0.000

	Reference person 3			Reference person 4		
	N	Mean	p-value	N	Mean	p-value
Contacts to family	8	1.28		10	1.13	
Contacts to non-family	19	1.71	0.067	20	1.35	0.209
Satisfaction family	10	0.20		11	0.36	
Satisfaction non-family	25	0.00	0.000	24	0.00	0.000

	Reference person 5		
	N	Mean	p-value
Contacts to family	7	2.86	
Contacts to non-family	19	1.97	0.179
Satisfaction family	8	0.38	
Satisfaction non-family	19	0.00	0.004

The Internet and information offering for the elderly

75 per cent of the seniors stated to have access to the Internet, on average since 7.34 years. Internet access as such is also considered as very important by this group (mean of 8.30). In view of the possibilities of information offerings, importance factors are even higher. General access to information offerings (e.g. for the purpose of leisure activities and general knowledge) reaches an importance factor of 9.00. Access to information offerings with a focus on the elderly (e.g. use of information filtering and new input) is rated with a factor of 8.59. Compared to the first two factors, the importance factors of listing events at a glance (e.g. benefit of easy and fast access to information) (8.00) and listing business hours at a glance (e.g. convenience of time saving and reduction of effort) (8.59) are slightly below, but still on a very high level. This indicates that there is a strong need for these offers.

Furthermore, there are interrelationships between the different options of access to information offerings. General access to information offers is significantly and strongly positive related to listing events (correlation factor of 0.47) and business hours (correlation factor of 0.38) at a glance. In comparison, there is no evidence of interrelationships between all other factors (see table 4). This means that the elderly who consider a general information offering as more important also prefer profound information as events or business hours. As there is no correlation between information offerings with a focus on the elderly and any other variable, it is likely that this group rather uses a community offer instead of a special one.

Table 4
Odds rations including participants and two-tailed significance for interrelationships

		General access to information offers	Information offers with a focus on elderly	Listing events at a glance
Information offers with a focus on elderly	Correlation Coefficient	0.28		
	Sig. (2-tailed)	0.16		
	N	27		
Listing events at a glance	Correlation Coefficient	0.47	0.05	
	Sig. (2-tailed)	0.01	0.82	
	N	29	27	
Listing business hours at a glance	Correlation Coefficient	0.38	0.10	0.33
	Sig. (2-tailed)	0.04	0.61	0.08
	N	29	27	29

Support of the elderly in the neighborhood

Regarding the importance of commitment and enhancement respectively, both factors (means of 6.48 vs. 6.40) lie in the medium range of consideration. In comparison with figures of support in these premises (6.66 vs. 7.44), values are slightly higher, but not at a level of high importance. In some measure, it is the same with importance factors of providing small services (6.59) as well as the importance of information for sport offerings (7.59) in the neighborhood.

Beyond descriptive statistics, a correlation analysis was conducted which delivers significant results in view of interrelationships (see table 5). Firstly, there is a strong

positive correlation (0.71) between the importance of commitment and the importance of support of commitment as well as between the importance of improvement and the importance of support of improvement (0.57). This means seniors who are interested in and dedicated to their neighborhood would also utilize support much more. The same effect even occurs when correlating the importance of improvement and the importance of support of improvement (0.41). Secondly, the importance of commitment is strongly positive correlated to the importance of providing small services (0.46). Hence, one can also state that elderly who are committed to their neighborhood are much more willing to become involved and offer small services, even without being paid. Thirdly, in contrast to this there is a strong negative correlation factor (-0.58) between the importance of providing small services and the importance of information for sport offerings. This means that the group of the elderly is divided. Whereas one part is still physically active and sporty and needs a lot of time for these activities, the other part has more time and is therefore more determined to offer small services.

Table 5

Odds rations including participants and two-tailed significance for interrelationships

		Importance of commitment	Importance of improvement	Importance of support of commitment	Importance of support of improvement	Importance of providing small services
Importance of improvement	Correlation Coefficient	0.36				
	Sig. (2-tailed)	0.08				
	N	25				
Importance of support of commitment	Correlation Coefficient	0.71	0.41			
	Sig. (2-tailed)	0.00	0.05			
	N	29	23			
Importance of support of improvement	Correlation Coefficient	0.24	0.57	0.12		
	Sig. (2-tailed)	0.25	0.00	0.57		
	N	25	25	23		
Importance of providing small services	Correlation Coefficient	0.46	0.20	0.28	0.14	
	Sig. (2-tailed)	0.03	0.38	0.21	0.53	
	N	22	22	22	22	
Importance of information of sport offers	Correlation Coefficient	-0.07	-0.11	0.27	-0.13	-0.58
	Sig. (2-tailed)	0.76	0.68	0.26	0.60	0.02
	N	22	18	20	18	15

Limitations

Despite a lot of applicable results, there are still some limitations in both surveys. Since interviews to gather data lasted up to three hours, many respondents did not reply to all issues, particularly in the context of follow-up questions at the end of the survey. This finding needs to be considered when conducting next surveys in the target group of elderly people aged 65 and above. Besides, as the first survey questioned only 37 and the second only 50 participants, many t-tests for unpaired comparisons, as well as correlations, failed to deliver significant results in spite of several assumed trends. Thus, further studies have to interview more persons to verify differences in the sample. Moreover, the analysis used one-dimensional scales for each question. Concluding, next surveys should incorporate standardized, multi-item scales to ensure validity and reliability.

Discussion

The results indicated several interesting, even some counter-intuitive findings, which need to be discussed. In general, the survey supports common findings from other papers and both megatrends (demographic change and information technology). An example for these findings is the fact that the social contact rate per week is decreasing with an increase in age. Common phenomenon, such as the inability to build sufficient trust to peers and the increased difficulty to find new contacts are consequences based on this fact. Based on the resulting loneliness, it is not surprising that up to 45% of the participants pinpointed the desire for more frequent direct interaction. One should also keep in mind that a small interaction bias might occur, since the participants of these surveys are considerably more socially active and seek for new contacts instead of disconnecting from the society by staying at home.

A counter-intuitive result is based on the motivation for small service offerings. Whereas one part of the sample is still physically active and needs a lot of time for these activities, the other part has more time and is therefore more determined to offer small services. This distribution also influences the motivation to utilize support of the neighborhood more frequently. Although a majority of participants addressed the need for more frequent contacts, a comparably smaller number is willing to utilize local support. This disinterest in local contacts could either rely on missing trust or missing common interests. In both cases, the average contact rate with family and non-family members is around 4-8 per week (compare to table1). Since a majority of these contacts are established via telephone, another interpretation could be that elderly desire more support but are not willing to receive it from strangers. The usage of the telephone further indicates a physical distance to other members, thus the limiting factor might rely in the hampered mobility of the elderly people. This would also be logically consistent with the differentiation between physically active and passive participants.

With regard to the interaction with others, the results are as expected. A majority of 58% desires a simplification for the first contact. Paired with the fact that the same majority of participants also wants to have more contact with non-family members (peers), we conclude that the missing mobility and the decrease in real-world offerings hinder many fruitful contacts, which could be established electronically. Although 75% of the elderly participants stated to have an Internet access, most of them did not lever this medium to get in contact with others. Thus, clearly one of the hurdles for a simple interaction relies in the fact of missing interfaces to get in touch with each other.

One possible way to resolve this issue is the usage and knowledge transfer of how to integrate these users in existing interfaces (e.g. the 400+% growth-rate in the elderly people segment on Facebook documents this trend, compare to Instrategylabs.com 2010). However, this growth is only a relative comparison; the overall numbers in the distribution still show a significant mismatch between the real demographic distribution and the virtual usage. The survey pinpointed the motivation of the elderly to interact and the possibility due to the existence of an Internet access. Nevertheless, these options are not used. One interpretation for this multi-causal influence is the inadequate interface combined with the missing trust in virtual environments.

With regard to empirical evaluation, this aspect needs further evaluation. This interpretation is underlined by the result of the overall high interest and importance of information offerings on the Internet. Based on our sample, elderly people are willing to leverage the opportunities of the information technology medium; however they are still lacking the knowledge how to access it properly. In order to understand the success of online services for elderly people, a requirement analysis in terms of benchmarking for best-practices could

provide solution scenarios. Besides this questionnaire-based approach, also other means serve to understand the usage of information technology mediums by the elderly. In case of providing social network trainings, pre-post experiments can show which factors mainly influence today's insufficient affinity to social media offerings. The main advantage of this procedure is that there is a wide field of possibilities how to conduct these experiments. Therefore, the elderly may be provided with a personalized face-to-face training, some forms of group learning sessions or informal learning opportunities on the Internet. No matter which training is chosen, the question behind these actions always reads as follows: How are elderly people inspired to use online social networks?

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6.3.   Veröffentlichung 3

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Purchase intention of Ambient Assisted living Technology- results from a german perspective

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ABSTRACT

THE AIM OF THE STUDY WAS TO ANALYZE OLDER PEOPLE'S ATTITUDE TOWARD A PRODUCT, AS WELL AS THEIR TRUST, AND PURCHASE INTENSION, FOR VARIOUS SCENARIOS OF AMBIENT ASSISTED LIVING (AAL) TECHNOLOGY. THE EIGHT DIFFERENT SCENARIOS INCLUDED SOLUTIONS FOR EACH OF THE FOUR AAL MARKET SEGMENTS. THE 77 PARTICIPANTS OF THE ONLINE SURVEY WERE BETWEEN 50 AND 81 YEARS OLD AND THEIR AVERAGE AGE WAS 63.9 YEARS. THE DATA WAS COLLECTED FROM SEPTEMBER TO OCTOBER 2011. THE STUDY REVEALED A STRONG SIGNIFICANT CORRELATION BETWEEN ATTITUDE TOWARD A PRODUCT AND PURCHASE INTENTION (BETWEEN 0.640 AND 0.793). FURTHERMORE, THE ATTITUDE TOWARD A PRODUCT IN AAL TECHNOLOGY SCENARIOS FOCUSING ON SECURITY AND HEALTH PREVENTION, WAS SIGNIFICANTLY HIGHER THAN IN SCENARIOS THAT FOCUSED SOLELY ON ISSUES OF COMFORT. THE VARIABLE PURCHASE INTENTION ALSO SHOWS SIGNIFICANTLY HIGHER VALUES IN SECURITY AND HEALTH CARE SCENARIOS, WHICH IMPLIES THAT THE ELDERLY ARE MORE LIKELY TO PAY FOR THESE AAL SERVICES. ANOTHER RESEARCH FINDING SHOWS AN SOLID OVERALL LEVEL OF TRUST IN ALL SCENARIOS, WITH NO SPECIFIC SCENARIO BEING SINGLED OUT. MOREOVER, A HIGH CORRELATION BETWEEN ATTITUDE TOWARD THE PRODUCT AND TRUST OF AAL TECHNOLOGY WAS DETECTED (BETWEEN 0.545 AND 0.695). FINALLY, THE PARTICIPANTS' AGES HAD NO INFLUENCE ON THE DIFFERENT SCENARIOS ACROSS ALL VARIABLES. THESE RESULTS INDICATE THAT FURTHER RESEARCH IN THIS INNOVATIVE TECHNOLOGICAL FIELD IS REQUIRED. EXPERIMENTS FOR ANALYZING THE LEVELS OF TRUST IN DIFFERENT AAL PRODUCTS, AS WELL AS TESTING THESE PRODUCTS WITH OLDER PEOPLE, WILL PROVIDE A MORE PRECISE PICTURE OF THE ATTITUDE TOWARD THE PRODUCT, AS WELL AS THE PURCHASE INTENTION OF AAL TECHNOLOGY.

5. KEYWORDS

AMBIENT ASSISTED LIVING, ATTITUDE TOWARD A PRODUCT, ELDERLY PERSONS, PURCHASE INTENTION, TECHNOLOGY, TRUST

INTRODUCTION

Does a connection between the three variables attitude toward a product, purchase intention and trust in different scenarios of Ambient Assisted Living (AAL) technology exist? **Based on this research question, the study analyzed these variables via an online survey of older persons. The development of AAL products has gained increasing importance in recent years [Costa et al., 2008; Kleinberger et al., 2007; Muñoz et al., 2011]. The German Federal Ministry of Education and Research is subsidizing the development of AAL technology and services with total funding of 45 million Euros [Ambient Assisted Living, 2008; Ambient Assisted Living, 2011; BMBF, 2008; BMBF, 2009]. Despite this, AAL as an area of social research is underrepresented. Thus, this analysis investigates the nexus between the attitude toward a product, as well as the purchase intention and trust in it, in the context of AAL technology.**

The connection of the attitude toward a product and the purchase intention has a long tradition in research [van der Heijden et al., 2003; Moon et al., 2008; Broekhuizen, 2006; Grewal et al., 1998]. As illustrated by Grewal et al. (1998), there is a strong significant correlation in the context of perceived value and purchase intention (Grewal et al., 1998). This link was also established by Broekhuizen (2000). However, the purchase intention does not always result in an actual purchase decision (Kotler and Armstrong, 2010). As one of the first authors, Muir (1987) analyzed the research object trust in technology. In the process, users and designers of human-machine systems were examined and "trust as a moderator between the properties of a machine and a human's use of that machine" was highlighted (Muir, 1987, p. 538). Today, the importance of elderly persons' trust in AAL as a multi-faceted technology is still in its early stages. Just a few articles have considered trust in assistive environments, along with its multiple implications [Coughlin et al., 2007; Coughlin et al., 2009; Sanchez et al., 2005; Wälivaara et al., 2009], whereas no research into trust of older people towards AAL exists [Steinke et al., 2012]. Hence, this study will also investigate people's trust in various AAL products and services and show how trust is related to the attitude toward the product as well as the purchase intention.

The article is structured as follows: Within the background section, the intersection of the need for assistive technology due to demographic change and AAL is described. Further, the four AAL market segments are outlined and the nexus between the attitude toward the product, the purchase intention

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and trust is described in reference to potential AAL products and services. The methodology section is separated into background information, questionnaire development with presentation of the eight scenarios and statistical analysis. In the analysis section, a descriptive scenario analysis as well as a statistical evaluation of the interrelations between the attitude toward a product, the purchase intention, and trust is investigated. Moreover, the influence of participants' ages on the AAL scenarios is explored. The final section contains the discussion of the results and implications for further research in AAL products and services.

Background

Ambient Assisted Living (AAL) describes a complex, highly dynamic information and communication technology domain designed mainly for the elderly. As a result of demographic ageing, AAL technology has gained importance in recent years (Wichert, 2010; Costa et al., 2008; Kleinberger et al., 2007; Muñoz et al., 2011). Due to the increasing life expectancy and consistently low birth rates, the German population will be one of the oldest in the world in 2035. By the middle of the 21st century, more than half of Germany's inhabitants will be older than 50 years and every seventh will be older than 80 years (Hampicke et al., 2011). Although ageing is not automatically equivalent to the need for care, the majority of the population increasingly relies on assistance, support and medical care with advancing age (Wichert, 2010). In 2009, 2.34 million people in Germany depended on care (Statistisches Bundesamt, 2011). The majority of older persons desire to remain in their accustomed living environment as long as possible (Wichert, 2010; Osl et al., 2010). Today, already 30 per cent of the over-60 year olds live in single households (Statistisches Bundesamt, 2010). However, the likelihood of care dependency increases with age, with 83 per cent of those in care aged 65 and above (Hoffmann and Nachtmann, 2007; Statistisches Bundesamt, 2011). In 2009, 1.07 million people were cared for at home (by relatives and / or mobile nursing services), while 717 000 were cared for in nursing homes (Statistisches Bundesamt, 2011). An age-appropriate design of the living environment, as well as the support and care of relatives or professional care services, make it possible for people to age in their accustomed living environment (Georgieff, 2008). To ensure the future care and support of the elderly, AAL technology will gain importance (de Ruyter et al., 2010). AAL technology refers to technical devices that provide various services to persons with special needs, in order to support them in their daily life.

The German Federal Ministry of Education and Research distinguishes between four market segments for AAL developments. Solutions of the first segment 'Health & Homecare' aim at the adoption of intelligent systems for assistance purposes supporting preventative health care and rehabilitation at home. Examples include reminder functions that support the management of medical treatment. Products of the second segment 'Safety & Privacy' are intended to identify imminent danger without limiting the freedom of movement – or, if possible – to increase the freedom of movement. Examples are floor sensors that identify emergency situations like a fall resulting in injury and then immediately call for help. Solutions of the third segment 'Supply & Household' support everyday household activities. Products of the fourth segment 'Social Environment' aim to support and facilitate participating in social life – particularly for those, who are limited to their accommodation, whether temporarily or long-term. These systems support access to information, learning, and communication with others.

The attitude of a customer towards a product, defined as a 'person's relatively consistent evaluations, feelings and tendencies toward an object or idea' (Armstrong et al., 2009, p. 160) influences their trust and purchase intention. The importance of customer trust is rising for companies since 'trust has become the cornerstone to a continuing relationship' (Armstrong et al., 2009, p. 463).

However, trust in AAL technology is a relatively unexplored research field (Steinke et al., 2012a). In this context, Steinke et al. (2012b) examined older persons' trust in sensors and characteristics of AAL technologies. In order to expect high levels of trust, sensors need to be visible and installed in the home environment and especially has to be reliable and simple to use (Steinke et al., 2012b).

The existence of purchase intention as a predictor of subsequent purchase is well documented in literature (Grewal et al., 1998) but does not always result in an actual purchase decision (Kotler and Armstrong, 2010). Factors, such as the attitude of others or unexpected situational factors like the expected income, expected price and expected product benefits, may change the purchase intention (Kotler and Armstrong, 2010).

Research Framework

3.1 BACKGROUND INFORMATION

The survey was based on data collected in an online questionnaire using the software "oFb – der onlineFragebogen" offered by the website www.soscisurvey.de. Personal contacts via email, social networks, forums and XING Groups were used to recruit participants. It was carried out between September 21 and October 23, 2011. In order to reach older people who may potentially use AAL products and services, the analysis was limited to consider only those aged 50 years and above.

In the 33 days period, 339 persons klicked on the questionaire's link, while 108 (32 per cent) completed it. When limited to the target age bracket, this figure fell to 83. After the exclusion of another six questionaires due to inappropriate answers – these participants evaluated each question of every scenario identically – 77 data sets were taken into account for the analysis. As a result of including only the participants aged 50+, the sample did not describe a cross-section of the German population.

Participants were between 50 and 81 years old and their average age was 63.90 years (median of 64.00 years) with a standard deviation of 7.89 years. The majority of 43 respondents (55.8 per cent) were male and a minority of 34 respondents (44.2 per cent) were female. With reference to their current employment situation, 40 persons (52.6 per cent) identified as having retired, with the rest (36 persons, 47.4 per cent) identifying as still being active in the workforce. Regarding housing situation, most participants answered that they lived together with others (61 people or 79.2 per cent), whereas 16 persons (20.8 per cent) lived in single person households. Concerning smartphones, the majority of 64 persons (83.1 per cent) stated that they did not have one, whereas 13 respondents (16.9 per cent) did.

3.2 QUESTIONNAIRE DEVELOPMENT

Eight independent scenarios were formulated relating to different possibilites of everyday life support. The questionnaire was originally drafted in German and translated into English. Each scenario was constructed on the basis of the same pattern: First, an intuitive everyday situation in an elderly person's life was depicted. Second, a solution for support in the specific situation based on the usage of a smartphone was described. Third, the advantages of each solution were highlighted.

The evaluation of the scenarios was conducted by means of classical test theory (Schnell et al., 2005). Participants were asked to envision each described situation and evaluate the solution. Three established scales were applied in each scenario to subsequently compare them. The first, derived from a study by Ziamou and Ratneshwar (2003), measured a consumer's opinion of a product and inclination to use it – meaning the attitude toward a product (hereinafter: PR). The second scale was initially developed by Rodgers (2004) and was used to measure a consumer's likelihood of buying a particular product or service – meaning the purchase intention (hereinafter: PI). The third scale, originally designed by Jian et al. (2000), was intended to measure the trust in a described solution (hereinafter: TR). However, only six out of twelve scale items were applied for the analysis since there was no difference between certain items when they were translated into German . Moreover, each scale was slightly modified and adapted to the specific logic of the scenarios. Each scale's items were measured on a seven-point Likert scale. The eight scenarios are outlined in Table 1.

TABLE 1. SCENARIOS FOR SUPPORT IN EVERYDAY LIFE (AUTHORS DESIGN)

Scenario 1 (addressing the market segment Safety & Privacy): Imagine, you are suddenly unwell and you need medical advice (e.g. in case of an allergic react ion or an intolerance of drugs). In this scenario, you can speak to medically trained personnel using your smartphone – no matter where you are. At the same time, your location will automatically be determined to assist you quickly and comprehensively.

Scenario 2 (addressing the market segment Safety & Privacy): Imagine, you are home alone and a medical emergency (for example a fall resulting in heavy injury) occurs. As a result, you are no longer able to make an emergency call. In this scenario, and with the aid of suitable sensors, your smartphone detects the distress and makes an emergency call automatically. Thus, an ambulance will be notified and could potentially save your life.

Scenario 3 (addressing the market segment Health & Homecare): Imagine, you are suffering from a chronic disease such as diabetes or hypertension, and therefore want to be able to easily monitor your condition. In this scenario, you are able to measure and evaluate blood sugar levels or blood pressure with your smartphone, and the help of suitable sensors in real-time - no matter where you are. If there is a deviation from the control condition, you will be alerted automatically. Thus, you can react quickly in case of an emergency.

Scenario 4 (addressing the market segment Safety & Privacy): Imagine, you leave your accommodation, but you have accidently left open windows or doors, or you have forgotten to switch off electrical devices. In this case, your smartphone automatically reminds you, with the help of appropriate sensors at the front door, to rectify this. Thus, you are able to prevent burglary, fire or flooding.

Scenario 5 (addressing the market segment Supply & Household): Imagine, you would like to perform small tasks (such as cleaning, shopping, mowing lawns), but due to your deteriorating health, you are no longer able. In this case, you can request housekeeping services from both voluntary as well as professional providers with your smartphone. Of course, the choice of provider is yours. Thus, it is ensured that you can continue to live in your home without sacrificing your standard of living.

Scenario 6 (addressing the market segment Social Environment): Imagine you plan activities whose feasibility can be affected by the weather (e.g. going for a walk or riding to visit a friend). In this scenario, your smartphone verifies the feasibility based on current weather forecasts, and subsequently it makes suggestions

on which activities are currently best suited to current conditions - no matter where you are. Thus, planning security is ensured and you do not have to cancel activities due to bad weather anymore.

Scenario 7 (addressing the market segment Social Environment): Imagine, you would like to do something, but you do not have any idea what. In this scenario, your smartphone is able to propose appropriate activities (such as a guided walking tour and a museum visit) and events (such as theater or cinema) and subsequently save them automatically - no matter where you are. If you have selected and saved an activity, your smartphone remembers it automatically. Thus, your everyday life is diversified on the one hand and organized on the other.

Scenario 8 (addressing the market segment Social Environment): Imagine you would like to get in contact, and /or make arrangements, with your family or friends - no matter where you are. In this scenario, you are able to simultaneously inform all of them about your current wishes (such as meeting for coffee or going for a walk) with the help of your smartphone. Thus, you are able to increase the probability, and the frequency, to get in contact with others.

Subsequently, numeric values for each scale in every scenario were calculated as latent variables per participant. Therefore, two quality criteria had to be fulfilled: reliability and validity. Assuming that each scale measures a continuous, normally distributed and latent variable, which was measured by indicators with minor measurement errors, numeric values could be calculated by averaging the items (Schnell et al., 2005). Thus, means of all participants' values for each latent variable were calculated to conduct a general evaluation.

3.3 RELIABILITY

Reliabilty is defined as the extent to which repeated measurements of a single object by means of one measuring tool deliver the same values. One popular coefficient to calculate reliability is Cronbach's Alpha. Alpha can take values from 0 to 1, whereas only those close to or above 0.7 are acceptable for empirical evaluations (Schnell et al., 2005). Cronbach's Alpha was calculated for all scales.

3.4 VALIDITY

Validity of a measurement tool is the extent to which it actually measures the value it is supposed to. There exist three differt kinds of validity: content validity, criterion-related validity and construct validity. In this context, only construct validity is relevant, which can be measured by means of a principal component analysis to evaluate the dimensionality of the instrument (Schnell et al., 2005). The residual components' eigenvalues and the percentage variance accounted for by each component were calculated. In accordance with Kaiser's Criterion, only components with an eigenvalue greater than 1 were retained (Kaiser, 1970).

3.5 STATISTICAL ANALYSIS

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In order to obtain results for the implementation of products and services mentioned in the eight scenarios, the 24 ascertained latent variables (PR01-PR08, PI01-PI08 and TR01-TR08) were analyzed. For this purpose, descriptive statistics and correlation analyses were conducted using SPSS Statistics version 17.

Data Analysis

4.1 VALIDATION OF RELIABILITY

Each scale (PR, PI and TR) could be considered as reliable for each scenario. Values of Cronbach's Alpha lay between 0.848 and 0.933 (for PR), 0.855 and 0.949 (for PI) and 0.712 and 0.847 (for TR) and were thus acceptable for a further empirical evaluation. In order to obtain the highest reliability for the trust scales, one of the six items was excluded.

4.2 VALIDATION OF VALIDITY

Content validity was also ensured in each case. Percentage variances in the principal component analysis lay between 0.702 and 0.834 (for PR), 0.775 and 0.908 (for PI) as well as 0.572 and 0.853 (for TR).

4.3 DESCRIPTIVE SCENARIO ANALYSIS

As illustrated in Table 2, means of PR01-PR08 in scenarios 1 to 4 were close to five or even above five and thus in the upper range on a seven-point Likert scale. In contrast, scenarios PR05- PR08, produced a clear distinction in participants' evaluations, as their mean scores of 3.32 to 4.18 lay in the scales' medium range. Thus, there is a split in the sample. The first four scenarios – dealing with offers regarding security and health prevention aspects – were generally considered more valuable than the last four which addressed delivering small services, planning activities, or getting in contact with others. These findings were approved by analyzing the purchase intention (PI01-PI08), since participants evaluated analogically to PR. PI01-PI04 featured mean scores of 3.99 to 4.49, whereas PI05-PI08 were only assessed with values between 2.59 and 3.37. This means the elderly were more likely to pay for solutions of the first four scenarios. It is likely this results from the close nexus between the attitude toward a product and the intention to purchase it. However, the intention to purchase a single solution was always ranked below the attitude toward it. This means that the value of a product is assessed higher than the willingness to pay for it. In contrast to PR and PI, mean scores of trust

solely lay in the medium range on a seven-point Likert scale. Thus, participants gave consistent scores with values around 4 on a seven-point Likert scale in all described scenarios, but did not highlight specific ones. Hence, no split between the first and last four scenarios could be detected. Although the means of TR01-TR04 were slightly higher than those of TR05-TR08, the gap was closer compared to PR and PI.

TABLE 2. DESCRIPTIVE STATISTICS OF ALL CALCULATED LATENT VARIABLES (AUTHORS DESIGN)

	PR01	PR02	PR03	PR04	PR05	PR06	PR07	PR08
N	77	77	77	77	76	75	76	77
Mean	4.92	5.31	5.11	5.05	4.18	3.36	3.32	3.60
	PI01	PI02	PI03	PI04	PI05	PI06	PI07	PI08
N	77	77	77	77	76	76	74	77
Mean	4.04	4.49	4.42	3.99	3.37	2.74	2.59	2.78
	TR01	TR02	TR03	TR04	TR05	TR06	TR07	TR08
N	77	77	77	77	75	75	76	76
Mean	4.41	4.60	4.52	4.62	4.33	3.89	4.25	4.22

4.4 INTERRELATIONS BETWEEN THE ATTITUDE TOWARD A PRODUCT, THE PURCHASE INTENTION, AND TRUST

Interrelations of respective pairs of PR and PI (e.g. PR01 and PI01) were observed by means of correlation analyses (see Table 3). Strong significant correlations between 0.640 and 0.793 showed that participants saw a very close link between these variables. However, there were no huge differences between the scenarios. This means that the attitude toward the product determines, to a similar extent, the intention to purchase it in each case. In relation to the nexus between the attitude toward the product and trust, there were also strong correlations (values between 0.545 and 0.695). However, values were slightly below those mentioned before. Nevertheless, PR and TR interact strongly with each other. Conversely, correlation coefficients between trust and the purchase intention were weaker to some extent in comparison with PR and TR across-the- board with one exception.

TABLE 3. CORRELATIONS BETWEEN THE RESPECTIVE PAIRS OF LATENT VARIABLES (AUTHORS DESIGN)

	PR01* PI01	PR02* PI02	PR03* PI03	PR04* PI04	PR05* PI05	PR06* PI06	PR07* PI07	PR08* PI08
Cor. Coef.	.640**	.771**	.787**	.793**	.745**	.745**	.794**	.723**
Significance	.000	.000	.000	.000	.000	.000	.000	.000
N	77	77	77	77	76	76	74	77
	PR01* TR01	PR02* TR02	PR03* TR03	PR04* TR04	PR05* TR05	PR06* TR06	PR07* TR07	PR08* TR08
Cor. Coef.	.695**	.634**	.604**	.604**	.545**	.642**	.639**	.628**
Significance	.000	.000	.000	.000	.000	.000	.000	.000
N	77	77	77	77	75	75	76	76
	PI01* TR01	PI02* TR02	PI03* TR03	PI04* TR04	PI05* TR05	PI06* TR06	PI07* TR07	PI08* TR08
Cor. Coef.	.497**	.593**	.607**	.583**	.437**	.618**	.561**	.616**
Significance	.000	.000	.000	.000	.000	.000	.000	.000
N	77	77	77	77	75	75	74	76

* correlated with

** Correlation is significant at the 0.01 level (2-tailed)

4.5 INFLUENCE OF PARTICIPANTS' AGES ON THE SCENARIOS

As illustrated in Table 4, a slight negative correlation was observed between participants' ages and PR01-04 as well as PI01-PI04. This resulted in a progressively less favourable attitude toward the product and purchase intention with increasing age. However, only PR03 and PR04 showed significant results. In any case, as already detected, the sample was split. Neither PR05-PR08 nor PI05-PI08 showed clear trends (correlation coefficients close to zero) or significant results. In terms of trust, there was neither a split in the sample nor a general trend with significant results that particpants' ages influenced TR01-08. This was illustrated by correlations with coefficients close to zero. In conclusion, there was no evidence that people of different ages evaluated the scenarios with respect to all variables differently in general.

TABLE 4. CORRELATIONS BETWEEN AGE AND EACH CALCULATED LATENT VARIABLE (AUTHORS DESIGN)

		PR01	PR02	PR03	PR04	PR05	PR06	PR07	PR08
AGE	Cor. Coef.	-.148	-.113	-.233*	-.257*	-.031	.039	.005	.149
	Sig. (2-tailed)	.199	.326	.041	.024	.790	.743	.965	.195
	N	77	77	77	77	76	75	76	77
		PI01	PI02	PI03	PI04	PI05	PI06	PI07	PI08
AGE	Cor. Coef.	-.123	-.078	-.178	-.105	.087	.005	.047	.097
	Sig. (2-tailed)	.285	.497	.121	.364	.456	.968	.689	.400
	N	77	77	77	77	76	76	74	77

		TR01	TR02	TR03	TR04	TR05	TR06	TR07	TR08
AGE	Cor. Coef.	-.053	.054	-.085	-.179	.031	.059	.110	.078
	Sig. (2-tailed)	.649	.641	.465	.119	.791	.615	.346	.505
	N	77	77	77	77	75	75	76	76

* Correlation is significant at the 0.05 level (2-tailed)

Discussion

The study explored older people's attitude toward a product, trust and purchase intension for various scenarios of Ambient Assisted Living (AAL) technology. The analysis revealed that products and services of scenarios 1 to 4, which referred to the market segments Safety & Privacy and Health & Homecare, were evaluated more favorably with reference to the attitude toward a product and the purchase intention. In relation to these variables, the sample was split. This means that the elderly were more willing to use solutions aimed at security and prevantitive health measures instead of those dealing with delivering small services, planning activities or getting in contact with other persons. When considering AAL technology, older people obviously focused on primary needs essential to ensure a safe life in their accustomed accommodations. Conversely, they generally did not place great emphasis on functions able to connect them with other persons or help them to maintain their house. Although many studies identified the need of older people for social contacts, they obviously seem not to prefer technical support to satisfy this need. At least, they rejected the possibilities offered in the scenarios. This is why prototype developments should concentrate on solutions dealing with Health & Homecare as well as Safety & Privacy issues. In doing so, there is also the advantage for the supplier that customers are willing to pay for these offers. In addition, the possibility to differentiate from competitors is even bigger in offering real products – which is constituted by many offers of the market segments Health & Homecare and Safety & Pricacy – instead of acting as a mediator offering intangible assets – what is very likely when addressing the market segments Supply & Household or Social Environment. As the attitude toward the product and the purchase intention were highly correlated, it is observed that the elderly are willing to pay for solutions to the extent they offer value. This means: The higher the value, the higher the willingness to pay. Thus, AAL solutions are not viewed as diverging from most products and services offered by other industries. Nevertheless, further research has to cope with older people's use of technology in various situations of daily supports by conducting experiments with working prototypes.

In contrast, there was no clear trend with relation to trust. Since trust in the solutions was assessed with scores in the medium range on a seven-point Likert scale, there was no wide difference between scenarios 1 to 4 and 5 to 8 in

relation to PR and PI. This means that trust – in contrast to the attitude toward a product and the purchase intention – does not depend on the the market segment a product or service is assigned to. However, further research, e.g. by means of other scales in surveys or experiments including prototypes, is required to verify these results.

In addition, a substantial nexus between trust and the attitude toward a product, as well as the purchase intention was detected. However, correlation coefficients for each variable were slightly below those between PR and PI. Since the connection between PR and TR was somewhat stronger in comparison to the connection between PI and TR, the attitude toward the product mainly influences trust. Vice versa, PR was very likely to have only a small impact on TR. Nevertheless, this finding needs to be verified by means of a regression analysis or other means of multivariate analysis methods.

In any case, this survey did not aim solely at the core target group of people aged 65 and above, but also included those with a minimum age of 50. Since the analysis was based on fictitious scenarios, the opportunity existed to find out if age influences the evaluation of PR, PI or TR. Although slightly negative correlations could be dectected with respect to PR and PI, no general trend was observed that older people evaluate PR or PI less favorably due to potential lower technology affinity. Thus, results acquired on the basis of today's elderly are able to be projected to the next generation of older and very old people. In addition, this offers the possibility to develop AAL products suitable for the mass wihtout addressing a specific age group. However, further studies, including more participants, are needed to validate this.

Further research is also requried with respect to the general outline of AAL technology questionnaires. Since the three scales could potentially influence each other, tailored and standardized scales for the purposes of AAL in form of a validated questionnaire should be developed and applied. Alternatively, experiments on the basis of working prototypes and an appropriate target group need to be conducted. This approach would allow a long-term observation with different target groups or pre-post comparisons with the same target group. On the basis of those results, detailed information on the willingness to pay for certain solutions should be gathered as the next step to develop valid business models for enterprise networks which deliver AAL

products and services. Additionally, elderly persons' trust in AAL technology will be underlined by model development and several experiments.

Limitations

In spite of many valid results, there are some limitations in the survey. Since only 77 participants were questioned, some t-tests for unpaired comparisons, as well as correlations, failed to deliver significant results. Since trends without significant results were observed in several cases, further studies must interview more participants to verify differences in the sample. This is why only age was considered to assess differences in the sample. Moreover, the study was conducted online with the result that few very old people were reached due to their low affinity for the Internet. Thus, average age of participants was below those of persons who will eventually use the products and services described in the scenarios. Further, the possibilty only existed to conduct scenarios envisioned for the German market.

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6.4. Veröffentlichung 4

03-WORKINPROGRE
SS-Fritsch_2012_Suc

An Approach towards Success Criteria of Social Network Sites for Elderly People

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Abstract

THE AMOUNT OF ELDERLY PEOPLE USING THE INTERNET HAS CONSTANTLY RISEN OVER THE LAST YEARS. DUE TO THIS TREND, AN INSTRUMENT TO MEASURE THE SUCCESS OF SOCIAL NETWORK SITES FOR ELDERLY PEOPLE IS REQUIRED. BASED ON EXPERT INTERVIEWS AN EVALUATION TOOL CONSISTING OF THE THREE WEBSITE CATEGORIES SOCIAL COMMUNITY, FORUM AND CONTENT MANAGEMENT SYSTEM WAS DEVELOPED. EACH MAIN CATEGORY INCLUDES SEVERAL CRITERIA WHICH HAVE TO BE VERIFIED BY FURTHER FOCUS GROUP DISCUSSIONS. ON THIS BASIS, A SUBSEQUENT ANALYSIS CAN BE CONDUCTED.

KEYWORDS: CONTENT MANAGEMENT SYSTEM, ELDERLY PEOPLE, FORUM, SOCIAL COMMUNITY, SOCIAL NETWORK SITES, WEBSITE ANALYSIS

An Approach towards Success Criteria of Social Network Sites for Elderly People

Introduction

The Internet is one way to make the existing social contacts more accessible for older people (Kaplan & Haenlein, 2010). Due to its increasing use, almost 60 per cent of people aged 60 years and above use the Internet for mails, information research, or online banking in Germany by now (Initiative D21, 2011). Especially the spread of user generated content was recognized not only within the younger generation (Boyd & Ellison, 2007; Studer, 2009). On par with decreasing social contacts with increasing age, the rising number of the elderly on the Internet offers high potential for social exchange platforms, especially in the German context (Fritsch, Silbermann & Steinke, 2012). According to the study by ACTA (2010), the membership of the elderly in Social Network Sites (SNSs) has also grown. Whereas in 2009 only three per cent aged 50 to 64 were active people in social networks, the number rose to ten per cent in 2010 (ACTA, 2010).

Due to this trend, an evaluation tool to measure the success of SNS for the elderly is needed in order to improve current offerings or to create successful new ones. In general, a website's success highly depends on the visiting frequency – the higher it is, the greater is the success. Thus, a measurement methodology referencing the functionality of a Social Network Site as a critical success factor is needed. For a profound measurement model, several SNS categories including several unique criteria have to be distinguished in order to provide a subsequent analysis.

Methods

Based on eight expert interviews in September 2011, numerous variables for the success of SNSs can be found. The interviews were executed face-to-face or by telephone. Reliability and validity of the statements were assured. For facilitating the evaluation, the dialogues were recorded and transcripts of interviews were prepared.

After implementation of the interviews, the transcripts were analyzed. In the first step, the most named variables were clustered and defined into categories. These categories should give a first overview about the websites' functional offers. Subsequently, main categories were allocated to the relevant clusters.

Results

On the basis of the defined criteria, websites mainly addressing the elderly can be analyzed. The three evaluated main categories within SNSs for this target group are (i) social community, (ii) forum and (iii) content management system.

(i) Social community includes the sub-categories user (profile; contact list; group functions), calendar (private and public events; share appointments), photos and videos (upload and embedding photos and videos; comments), as well as private and direct messaging (single and mass messages; e-mail notification).

(ii) The second main category forum contains general functions (as an internal search function), user (profile; avatar; contact list), topics (display topics according to certain criteria) and posts (preview; attachments; post rating).

(iii) The content management system includes also general functions (plug-ins; poll-function)   as well as Tools/ Widget (latest comments/ news; spam protection), publishing- options (user can write articles; articles can assigned to multiple categories or be published on a homepage) and cross-publications (post transported to an article).

Discussion

The above seen methodology of analyzing success factors of SNSs for the elderly reveals the three main categories social community, forum and content management system. The respective sub-categories show the diversity of successful SNSs. The interaction via user account is integrated in two of the main categories. Moreover, the communication by private or direct messaging, posts or publishing of articles can be found within all three main categories. By an easy usability of the SNS these features should lead to a higher usage of the website within the target group. Besides the subjective and following objective evaluation, in particular in the area of social networks, network effects need to be kept in mind.

To complement the experts' input, in the next research step focus group discussions including junior researchers from different German Universities were consulted. For a follow-up analysis, the various criteria within the sub-categories have to be structured to develop a quantitative valuation method for German SNS for elderly people. Given this classification, a subjective evaluation of these SNSs will be conducted by means of standardized scales.

For a further examination, websites that provide additional statistical data such as „seitwert.de" (Seitwert.de, n.d.) and „alexa.com" (Alexa.com, n.d.) should be taken into consideration. Depending on the functional offers of single websites, the analyzed websites should achieve scores for each of the three main categories. Subsequently, the three scores have to be added to the final score by using a special weighting to compare the websites. When determining the weighting factors, the decisive added value of a website has to be considered by the most pronounced function. Using this procedure, it will be possible to compare the website's success of websites for elderly people. Additionally, future work should also analyze the benefits for the elderly that arise by the use of social networks and how they can be supported in daily routines.

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6.5.   Veröffentlichung 5

04-FINAL-Social
Network Sites for Elde

Social Network Sites for Elderly People - A Critical Analysis of Established German-Speaking Online Platforms

Tobias Fritsch, Daniel Brem, Frederick Steinke, Andreas Muhl-Lassen, and Frederik Kerssenfischer

***Abstract*—Due to the increasing Internet usage of elderly people, Social Network Sites (SNSs) for this audience group gain in importance. The present study analyzed 19 German- speaking online platforms for the elderly with regard to 26 specified success criteria. Therefore, a subjective evaluation on the basis of those criteria was conducted for social community, forum and content management system as most important types within SNSs. In order to approve this evaluation, objective data was gathered from providers of third-party website analyses. On the basis of a group discussion and an additionally matrix analysis, the study showed that website's success does not depend on the quantity of offered main categories but rather on mature and distinct functional offers. Within the matrix analysis, a large variance (41.8 vs. 6.0) between the analyzed SNSs was highlighted. Within this important audience group, achieving a critical mass is a major prerequisite for a successful SNS.**

***Index Terms*—Elderly, internet, older people, social network sites, sns.**

I. INTRODUCTION

Social interaction is an innermost human need at any age [1]. However, especially elderly people often have to suffer from isolation since family and relatives do not have enough time to care or the number of close friends decrease. Due to global demographic changes, the situation will increasingly exacerbate [2]. As a result of this trend, the Internet gained in importance for older people and many online offers for the elderly arise. However, these websites are not equally successful. In general, a website's success highly depends on the visiting frequency: the higher it is, the greater is the success of the website [3]. For some websites and especially for SNSs, not only the time of visiting but more the social ex- change within a platform is important. In particular, older people have special requirements for SNSs [4]. Thus, a measurement methodology referencing the functionality of a SNS as a critical success factor is needed which can be proven additionally by objective third-party data.

The current research approach is based on [5]. In line with his findings, the present article contains an empirical approach to use the pre-defined categories of SNSs as well as specific criteria in order to analyze offerings for elderly people. Thus, the research question of this article is defined as follows: *Which characteristics determine the success of German-speaking Social Network Sites for elderly people and how can this success be measured?*

II. BACKGROUND

This section contains the background information about the aging population and an increasing Internet usage by older people. It is referred that these developments lead to a growing demand for age appropriate SNSs.

A. Aging Populations

The demographic change, meaning a growing aging society [2], is one of the global mega trends in the 21st century [6]. Germany is one of the most involved countries. The German population will belong to the oldest in the world by 2035. By the middle of this century, more than half of Germany's inhabitants will be older than 50 years [7] and the proportion of people aged 65 years and over will increase from one fifth in 2005 to one third in 2050. Analogically, the over eighty-year old people will even triple to more than 10 million people [8].

Main factors for this trend can be seen in an increasing global life expectancy, a declining fertility rate and an aging of the "baby boom" generations [9]. Adapted from [10], the Federal Republic of Germany is thus subject of the so called "threefold ageing" as the following three criteria are met: Absolute growing figure of older people, relative increasing number of older people compared to the younger and rising number of very old people, defined as 80-year-old and above. Thus, the importance of age appropriate products and services can be seen as a social challenge for a durable integration into the society.

B. Increasing Internet Usage

The Internet is one way for older people to make existing social contacts more accessible or to establish new ones [11]. Due to its increasing use, almost 60 percent of people aged 60 years and above currently use the Internet for mails, in- formation research, or online banking in Germany [12]. Especially the spread of user generated content was recognized not only within the younger generation [13], [14].

On par with the negative correlation between age and the number of social contacts, the rising number of elderly people using the Internet offers high potential for social exchange platforms, especially in the German context [4].

According to the study by [15], the membership of the elderly in SNSs has also grown. Whereas in 2009 only seven percent of people aged 40 to 49 and three percent in the age between 50 and 64 are registered in social networks, the numbers rose to 20 percent (age 40 to 49) and 10 percent (age 50 to 64) in 2010 [15].

C. Demand for Age Appropriate SNSs

The usage of SNSs in general is accompanied by various reasons. The mentioned challenges demonstrate the demand for age appropriate SNSs. Therefore, an evaluation tool to measure the success of SNS for the elderly is needed in order to improve current offerings or to create successful new ones. Thus, a classification of existing SNSs for elderly is implemented based on pre-defined criteria.

III. Methods

A. Classification of SNSs

In order to evaluate SNSs in view of their functional offers, various categories had to be defined. Considering the variety of existing functions on websites, a unique grouping in accordance with the detection of multiple different function designs in various categories (such as forums, social community, or free mail provider) was difficult. Thus, the author conducted various expert interviews in order to detect a general classification and the most important success criteria for each SNS category [5]. Due to the following focus group discussion, the main categories were defined as „social community", „forum "as well as „content management system (CMS)". It is based on the OSI Reference Model by [16], which represents an abstract form of structure commonly used in computer science. The defined criteria are illustrated in Table I.

B. Matrix Analysis

C. Website Analysis Tool

On the basis of the subjective evaluation of the SNSs by means of the matrix analysis, the Website Analysis Tool (WAT) was used to objectively assess the websites. A correlation analysis was conducted to outline interrelations of the gathered data. Before this background, it became possible to compare these results with those of the matrix analysis.

For further examination, the WATs „seitwert.de"[17] and „alexa.com "[18] were used.

[17] offers its own evaluation of websites by use of various criteria and their weightings. [18] registers the users´ accesses to websites and allows an interpretation of the users' average profile and their attitudes on the basis of this data and its subsequent processing. It analyzes quantitative facts such as the „amount of time spent by a user on a website", the „site views per user" or the „percentage of users with a single site view". The results are reflected in a score system which ranges from zero (0) to 100. In this context, Google PageRank [19], which assesses the link popularity of websites on the basis of an algorithm ex- post and also indicates the success of a website, provided additional data.

IV. RESULTS

A. Matrix Analysis

The final scores achieved within the Matrix analysis are illustrated in Table II. It is notable that a social community (SC) and a forum (F) was existent at more than half of the tested websites, all ranked in the upper third. By contrast, a content management system (CMS) is less widespread (only for out of 19 websites). Since there obviously was no general distinction between the analyzed SNSs in terms of the function offers, a good ranking depends more on a well- established and mature functional offer.

TABLE II: FINAL SCORES OF THE MATRIX ANALYSIS (SOURCE: AUTHORS' The website's assessment was conducted with reference to

	SC	F	CMS	Score
platinnetz.de [20]	x		x	41.8
seniorentreff.de [21]	x	x	x	40.0
MC50Plus.de [22]	x	x		32.6
ahano.de [23]	x	x		32.0
50plus-treff.de [24]	x	x		31.0
Romantik-50plus.de [25]	x	x		31.0
feierabend.de [26]	x	x		24.8
herbstzeit.de [27]	x	x		24.6
planetsenior.de [28]	x	x	x	24.2
aktiv 50.net [29]	x	x		23.6
silbernetzwerk.de [30]	x	x	x	23.0
valvere.de [31]	x	x		23.0
senioren-ratgeber.de [32]		x		19.0
sencity.de [33]	x			11.0
reifezeit.net [34]	x			6.0
aktive-rentner.de [35]				-
55plus-magazin.net [36]				-
senioren-kompass.de [37]				-

the classification of the SNS. The 26 criteria ensured full applicability of the three categories. Every website obtained subjective scores for its functional offers by means of a four point Likert scale. The scores ranged from 0 („not existent") to 3 („very pronounced function"). Depending on functional offers of single websites, the analyzed SNS achieved scores for each of the three main categories.

Subsequently, the three single scores were added to the final score by using a matrix, within the so called matrix anal- ysis. In order to do so, special weighting factors were set up to compare the SNSs among each other.

In order to determine the weighting factors, the decisive added value of a website was assessed by the most pro- nounced function. In case there was not only one main cate- gory, the one with the highest score was weighed by 60 per cent and the other one by 40 per cent. If all three appeared, the one with the highest score was weighted by 60 per cent again, the others by 20 per cent. Due to the rating of 0 to 3 points for the 26 criteria per main category, a maximum value of 78 points can be reached for every evaluated SNS. Since four out of 19 websites were magazines and guides for older adults without the possibility of opening a personal design)

As seen in Table II, four websites were not integrated into account, these pages could not be

evaluated using the matrix analysis.

the numerical evaluation due to the missing possibility of social interaction by means of user accounts [35]-[38]. The analysis of the remaining 15 SNSs for elderly people revealed that [20] got the best overall score (41.8). Those three SNSs with only one interaction category each [32]-[34] got the lowest score (19.0 to 6.0). Only three out of 15 SNSs

provide all three main categories [21], [28], [30] Due to the fact that a maximum value of 78.0 was achievable, the end values of the analyzed SNSs were in the middle or lower range.

TABLE I: EVALUATION OF THE MAIN CATEGORIES SOCIAL COMMUNITY, FORUM AND CONTENT MANAGEMENT SYSTEM (SOURCE: SUTHORS' DESIGN)

Social Network Sites

Social Community Forum CMS

General Functions
- Networking with known social communities

User
- User Profile
- Contact lists and grouping function
- Pin board
- Ability to establish groups
- View online contacts
- Chain function (concatenation of friends)
- App functions
- Adjusted for rights and privacy requests

Calendar
- Display of private and public events
- Adjustable rights for access and visibility
- Function to share appointments
- Further release function
- Extra points

Photo Album and Video Functions
- Simple upload / java mass upload

- Receipt of the photo quality
- Grouping function
- Adjustable for access rights
- Embedding videos
- Comments / like me

Private Messages and Direct Messages
- Single and mass messages
- Display (read / unread) messages
- Input messages about events (contact in- quiry)
- "Poke" function
- E-mail notification of new messages
- Direct message

General functions
- Adjusted for rights and privacy requests
- Internal search function
- Networking with known social communities

User
- User Profile
- Avatar
- Contact lists
- View online contacts
- Adjusted for rights and privacy requests

Private messages
- Private messages
- Display (read / unread) messages
- Extra points

Topics
- Display topics according to certain criteria
- Topics and forums can be subscribed
- Ways to manage subscribed threads and forums
- Displays the users who access a topic
- Ability to send a link to a topic by e-mail

Posts
- Preview
- Various tools for creating / managing a topic
- Integration of video or graphics
- Attachments
- Poll function
- Post count
- BB-Code
- E-mail notifications of replies
- WYSIWYG „What You See Is What You Get"
- Post rating

General functions
- Layout and design created with CSS
- Plug-ins
- Internal search function
- Optimized for Smartphone
- Comment function
- Poll function

Cross-Publications
- Post can be transported to an article
- Blog entry can be transported to an article

Tools / Widget
- Latest Comments
- Latest News
- HTML widgets from third-party
- Spam protection
- Extra points

Publishing – options
- Users can write articles and publish
- Articles can be assigned to multiple categories
- Articles can be published on a home- page
- Preview function
- Adjustable rights for the article consideration
- Publication in the future
- Content-life-cycle-management function
- Status of an article (published / inactive)
- BB-Code
- Integration of video or graphics
- Attachments
- WYSIWYG „What You See Is What You Get"
- Post rating

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First, there was a strong significant positive correlation between the final scores of the SNS and the data from seit-wert.de. This finding validates the subjective evaluation of the SNS on the one hand, and, on the other hand, corresponds to the assumption that a well-established functional offer is the key success factor for SNS when referencing elderly people. This result is even more impressive since the correlation between the final score of the WAT and the overall assessment of [17] is still stronger. The small but notable difference of the correlation between [19] and [17] overall assessment stems from the fact that PageRank is part of the seitwert.de final verdict. Since a website operator is able to influence the PageRank, it should not be used as a single indicator for the success of a website.

Second, a strong significant correlation between the site views per user and the final score of the matrix analysis proved the assumption that the direct comparison of diverging attitudes of users was more meaningful with regard to different categories.

Third, the very strong significant correlation between time spent on a website per user " and „site views per website and user" reflects the fact that the average number of site views increased when the estimated amount of time spent on a website increases and vice versa. The positive significant correlation between the overall assessment of seitwert.de and the site views per user, or the time spend on a website per user respectively, confirm the assumption that a website's success highly depends on the visiting frequency.

Fourth, in terms of the „share of website visits with only one site view" and the "site views per website and user", the time spent on the website must be limited since any other action on the website would indicate the exclusion from this category. Accordingly, a negative correlation between these two sets of data could be observed. Furthermore, the user was able to spend a certain amount of time on a website by a site view only (e.g. just reading) before deciding to close the page. In addition, there existed a negative increase of the percentage of users with a single site view compared to the average site views per users. If the average site views per user increased, the percentage of users with a single site view decreased.

V. Discussion

an age-specific community site therefore seems to be working only partially. The existing SNSs for elderly have a lot of potential for improvement. Future work should analyze the benefits for the elderly that arise through the usage of

The study showed that a website's success does not only depend on a great number of offered main categories, but rather on mature and distinct functional offers.

Websites focusing on content management systems such as magazines and guides showed a significantly higher percentage (up to 70 per cent) of users who only view the page a single time. This fact can be explained by good rankings of these websites´ contents in search engines. By entering key- words into the search engines, users are directed to the corresponding website and can access the desired information. As soon as their needs for information are satisfied, there is no reason for remaining on the website and thus, users leave. In doing so, the user has viewed the content of the page only once.

A website's aim is to encourage the user to spend time on it as well as to increase the number of site views per user or to keep it on a high level in order to generate revenues (such as Google AdSense, integrated shop, or the like button). Even though the presented numbers are partially low, there is no indication of an unsuccessful website. Google Page- Rank rates a website as successful in case it was ranked with a result of five and possesses high link popularity.

Despite a rather short amount of time spent on the website and a small amount of site views, a website can nevertheless be successful.

Websites which focuses on social communities and forums offer their users a wide range of possibilities to interact (e.g. creation of a personal profile, messages, instant messaging, or the like button). This fact leads to an increased amount of time spent by a user on those sites as well as to increased site views. The significant correlation between the time spent on the website and the average site views per user leads to a high number of site views. For a content-based account, the percentage of users with only one site view is expected to be very high, while the amount of time spent and the number of site views by a user can be very low. This fact differs from websites offering a social community. Hence, the number of users who only view a page once decrease.

VI. CONCLUSION

The analysis of social networks for elderly documents the current state of development in the field and highlights the existing functionalities in German networks. Based on the obtained results, an estimation of the distribution, application and potential of websites can be achieved in this research area. Features leading to a particularly high usage were identified within the target group and the contributing effects were shown accordingly. In summary, the current SNSs for elderly people were discussed and a matrix analysis was presented. However, as already stated, network effects in this particular target group have also a significant impact on the actual use of a website. By achieving a critical mass, for example due to easy usability of the website, existing SNSs as Facebook can be pioneer for social exchange platforms with an audience group specific content [39]. The concept of SNSs. Furthermore, experiments should be executed to answer the question how SNSs support older people in their everyday life.

A. *Limitations*

Firstly, the main categories for the criteria for evaluation based on expert interviews and focus group discussions. Moreover, there could exist additional criteria for the evaluation of the SNSs for elderly people.

Secondly, the timespan of analyzing and evaluation of the 19 websites was from September to November 2011. Till today, there can be deviations within content and functionality of the different SNSs.

Thirdly, the rating of the SNSs and the resulting overall scores based on the authors appraisals and experiences.

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6.6. Veröffentlichung 6

Veröffentlichung6-Pe
rsonalRemoteAssisted

Personal Remote Assistance in Ambient Assisted Living
– Experimental Research of Elderly People's Trust and Their Intention to Use

ABSTRACT

The objective of this article is to analyze the meaning of two different support functions regarding the use of Ambient Assisted Living (AAL). Thirty-two older persons (mean age =69.84; SD=6.31) and a younger control group (n=21; mean age=24.71; SD=2.10) were examined in an experiment with three different tasks using a tablet computer. The first group operated with a mock-up that provided personal remote assistance (PRA), and the second group with one that provided embedded technical assistance (ETA). The main results show that older participants with PRA solve significantly more tasks than people with ETA. Moreover, a significant influence of perceived ease of use with PRA is revealed. Multiple regressions in the senior sample highlight a significant connection between trust in AAL technology and perceived reliability as well as perceived ease of use. No significant correlation between the type of assistance and older persons' trust, as well as an intention to use AAL, was found.

Research Highlights:

- Personal remote assistance (PRA) leads to a higher number of solved tasks by the elderly in the AAL experiment

- The elderly had more problems solving the tasks correctly – even with PRA– than younger people

- Elderly people's perceived ease of use is positively influenced by PRA

- Trust in AAL technology is positively influenced by perceived reliability as well as perceived ease of use

- The intention to use is significantly influenced by perceived usefulness

- The type of assistance had no significant correlation with trust and the intention to use

1. Introduction

During the last decade, assistance technology in the home environment has gained in importance. Smart home technologies, which provide additional living comfort, have been brought to the market (Demiris & Hensel, 2008). In particular, ambient assisted technologies in the home environment are a growing research field with several European projects implemented since 2008. All of these projects have one thing in common: to support persons with the need of care to promote a longer independent life in their homes (AALJP, 2012). The research project "Smart and Independent Living for the Elderly" (SMILEY) underlines some important possibilities for technical support in the home environment (Fraunhofer ISST, 2013). The key phrases "access to information", "security in the household", "remembering things" and "remaining active and fit" summarize important demands, which should be addressed by AAL technology. In short, AAL comprises technical support in the home environment for elderly people (Becks, Dehm & Eberhardt, 2007). One example solution for the use of this technology would be a household equipped with sensors and actors that monitors a situation in which a person falls down. In the case of an emergency, the technology can automatically alarm relatives or an emergency physician (Chiriac & Rosales, 2012). Moreover, these in-home technologies may have an influence on communication towards the elderly and could strengthen personal relationships (Huber, Shankar, Caine, Connelly, Camp, Walker & Borrero, 2013).

In contrast to the demand for independent living, elderly persons tend to be very skeptical towards supportive technologies. The older generation did not grow up with technologies like personal computers. Therefore, those people have more difficulty using computer-based technologies (Prensky, 2001; Zhou, Rau & Salvendy, 2012). During the course of their research, they also found that elderly consumers have a lower degree of acceptance towards medical home monitoring systems than younger ones (Ziefle, 2011). One important reason for the use of medical technology is trust (Montague, Kleiner & Winchester III, 2009), which also has to be considered when developing AAL technologies. Furthermore, the reliance on technology is influenced by the degree

of trust the user feels towards technology. For instance, technology that people did not trust was more likely to be rejected (Lee & See, 2004). In literature, plenty of articles can be found that cover the topics of human's trust in automation in general – especially in the fields of aviation and the military (Neyedli, Wang, Jamieson & Hollands, 2010) – as well as the comparison of trust between humans and trust between humans and technology (Madhavan, 2007). However, the interaction of elderly people with assistance systems is rarely covered. For the case of trust in AAL technologies, very little research exists (Steinke, Fritsch & Silbermann, 2012). Following the above logic, elderly people can be expected to have a need for help when using new technologies. This statement can be supported by findings from the requirement analysis within the research project SMILEY which show that concern exists in a difficult handling of an AAL technology (Fraunhofer ISST, 2013). To counteract these concerns, support by technicians and experts of the provider, while setting-up and using the technology, might help. To cover and investigate this required support, the present article differentiates, in an experimental setting, between two types of support functions for older people using an AAL application on a tablet PC. The first support function is "remote assistance" (Mohammad, Bhattacharjee & Kwak, 2005), which enables a third person to act on the computer from a remote location if necessary. Additionally, this remote assistance is extended with a Voice over IP (VoIP) function including a video function (through which the older end-user can communicate with the service center (Torres-Padrosa, Calle, Marzo & Rovira, 2012; Zhang & Ansari, 2010). More precisely, in the intervention group, a member of the service-provider staff appears on the tablet PC screen and supports the older person via verbal instruction or remote clicking. In the present study, the term personal remote assistance (PRA) will be used, since the focus lies on the personal contact and support in contrast to the second type of assistance.

The second support function is derived from embedded user assistance which is integrated into the user interface (Aleven, McLaren, Roll & Koedinger, 2006; Corbin, 2003; Grayling, 2002). No personal support will be given in this type of assistance. The participants have to solve the tasks on their own with the aim of embedded technical assistance (ETA). In the experiment, ETA is

characterized by an integrated technical support which is given by highlighting a button in cases where the participant is unable to choose the correct button.

A previous study revealed that a short video instructing how to use a ticket vending machine helped older adults to improve their results in contrast to a younger control group without video instruction (Sengpiel & Wandke, 2010). The present article aims to investigate whether it is useful to integrate a real-time assistance function in an AAL application or not. For this purpose, the study will confront participants with both of the above presented assistance types – PRA and ETA – to analyze older people's perceived ease of use, trust, and intention to use, in the context of AAL. The main research question this paper addresses is the following: *Does a significant relationship exist between elderly people's trust and the type of assistance integrated into an AAL application?*

2. Background

2.1 Elderly People in the Context of Ambient Assisted Living

Western societies, and especially German society, are characterized by demographic ageing (DESTATIS, 2011). Today, Germany already shows the highest percentage of people aged 65 years and older within the European Union (DESTATIS, 2012). A central concern of elderly people is their living situation. Most of the elderly prefer to stay in their accustomed living environment and live independently for as long as possible (Osl, Benz & Österle, 2010; Fraunhofer ISST, 2013). Moving into nursing establishments equals a loss of autonomy and quality of life. Furthermore, once they have moved out of the accustomed environment, the elderly perceive this step as a manifestation of weakness (Schneekloth & Wahl, 2005). Research scientists have identified these needs of elderly people and developed new technologies that help to compensate deficits due to age and disability in order to support their "active ageing" (WHO, 2013). Intelligent systems can prevent elderly people from making fatal mistakes, such as medication errors, and thereby disburden professional care attendants and reduce costs (BMFSFJ, 2001). New household robots provide technical assistance at various levels. A desktop robot helps the severely handicapped to spoon food from a plate (Bestic™, 2013) or the human-robot ASIMO serves drinks or puts the

dishes into the dishwasher (ASIMO, 2013). These new technologies, which have their origins in Ubiquitous Computing (UC) (Weiser, 1991) as well as Ambient Intelligence (AmI) (ISTAG 1999), could also serve to improve quality of life and enhance independent living (Georgief, 2008; Stephanidis, 2009; Streitz, 2010). Technologies which accomplish those tasks are summarized under the term of "Ambient Assisted Living" (Giesecke et al., 2005; Becks, Dehm & Eberhardt, 2007).

AAL refers to "intelligent systems that will assist elderly individuals for a better, healthier and safer life in the preferred living environment and covers concepts, products and services that interlink and improve new technologies and the social environment" (AALIANCE, 2010). The central aim of AAL is to enable the elderly to live an independent life in their own accustomed living environment. The technology operates automatically and unobtrusively in the background. Since AAL is developed as assistance technology for a safe and longer life at home, the credibility of this technology influences the usage. For example, if a person falls down and remains lying unconscious on the floor, the end-user of the AAL, as well as their relatives, has to rely on the fact that the technology is reliable in such an emergency case. AAL technology, which acts in the background, has to be reliable and trigger the alarm immediately in order to start the emergency reaction process. Another example of a critical situation which can occur in the household is fire.

A study shows that around 200,000 reported fires in Germany per year cause approximately 600 deaths (Stiftung Warentest, 2002). Further data for the UK show that every year 500 people die as a result of domestic fires and more than 13,000 are injured (Blazescape, 2012). In addition to these facts, a further study (Jonsson & Bergqvistt, 2013) reveals that in Sweden the number of people who die as a result of fires increases with age. Supplementary to smoke detectors, which make a noise in case of fire, stove sensors in AAL technologies are developed to turn off the stove automatically in case someone has forgotten to turn it off manually (Becks, Eberhardt, Heusinger, Pongratz & Stein, 2010). In cases of these critical situations described above, people will not use the technology if they are not convinced that it works in the correct manner. Moreover, in other

non-critical examples, such as closing the windows automatically via remote control, the end-user should trust that the technology functions. As AAL technology is often sustained by a human service provider, this interconnected system will be influenced by technological and interpersonal trust.

2.2 Technological and Interpersonal Trust

One type of trust is technological trust – so called trust in automation. Parasuraman and Riley (1997) define automation as "execution by a machine agent (usually a computer) of a function previously carried out by a human". As this type designates a human's trust with a technology or device (Muir, 1994), the main difference to other types of trust is that the trustee, in this case, is a machine. New technologies become increasingly complicated and humans cannot cope with the full degree of complexity. Humans cannot fully understand the processes behind the results of automation. Still, they have to rely on automation to use it in an adequate manner (Masalonis & Parasuraman, 1999). Therefore, trust can be seen as a mediator between humans and automation by guiding reliance (Lee & See, 2004). In a human–human relationship, trust will erode if the trustor recognizes that the trustee always has the best intentions but his/her behavior does not reflect this intention (McKnight, Cummings & Chervany, 1998).

In addition to the concept of trust in automation, a brief remark on the concept of interpersonal trust should be mentioned. Generally, interpersonal trust is separated into two types that can be seen in the differences between the views of Rotter (1971) and Rempel, Holmes & Zanna (1985). These become apparent when comparing the scope of the trustee. Whereas Rempel et al. (1985) investigate trust in "close relationships", Rotter (1971) uses the "interpersonal trust scale" (ITS) to measure a general disposition in the person to see the degree of trust in general interactions in social life. Trust in a particular person may vary from one situation to another and is strongly influenced by the trustee's previous behavior. Pilots, as well as health-care givers, nurses and physicians, are professions connected to high personal trust. Nevertheless, these people can also make mistakes or handle technology in an incorrect manner, which leads to lower trust in this occupational group on

subsequent occasions. Buck & Bierhoff (1986) also stress the fact that interpersonal trust is not constant over time and depends on the degree of emotional bonding towards the other person. Thus, it would not be possible to predict the degree of trust in a specific situation by drawing from general dispositions. In the context of AAL, unexpected situations arise, which increase the importance of considering trust.

An AAL application can only be seen as a substitute for a supporting professional, but obviously not for a friend or family member. The present study does not compare technological versus interpersonal trust, but rather technological versus a hybrid form of both trust types. PRA, as well as the embedded technical support function, will be used for gaining new insights into trust in AAL technology.

3. Methodology

The experiment used in the present article is based on results from a previous questionnaire survey with 292 participants (mean age=74.39; SD = 10.01) (Steinke, Bading, Fritsch & Simonsen, 2014). According to the trust model of Lee and Moray (1992), trust is not based on a single event but rather an accumulated number of events. To gain a more generalizable evaluation within this former study, older adults were asked about their trust and different other variables in two AAL scenarios in the domestic environment. The first scenario characterized an emergency case within the apartment, in which a person fell down and was injured. The other scenario described a situation in which a person forgets to turn off the stove and the AAL technology received his/her attention (Steinke et al., 2014).

Following these scenarios, the tasks in the present experiment are also embedded, in situations that may emerge in a household, to convey the benefit of the AAL technology to the users. User surveys within the research project SMILEY revealed different useful fields of application for elderly end-users (Fraunhofer ISST, 2013). Due to the fact that the experimental design cannot realistically cover an emergency situation such as a person falling, the authors have focused on three realizable scenarios for the experiment. As described above, home fires are dangerous to the lives of residents

and might be better controlled by stove sensors. Therefore, the first scenario included the operation of stove sensors. The two further experimental tasks included the control functions of windows and lights in an integrated AAL technology. These functions provide the possibility to make the house safer, as well as appearing inhabited, and can be seen as an entry point for more critical AAL solutions.

3.1 Sample

After conducting a preliminary study with five students, the experiment was conducted with an intervention and a control group. For the intervention group, 32 participants, whose minimum age was 60 years, were recruited. Due to the fact that AAL technology is developed especially for extending independent life in private homes, all of these older participants are still living in their own apartments. For the control group, younger participants were recruited via the university in Munich. A total of 21 students agreed to participate in the study. All in all, 53 persons participated in the experiment. The intervention group of elderly persons (n=32; mean age=69.84; SD=6.31) was randomly divided into one group with PRA (n=15) and another group with ETA (n=17) before the experiment started. The control group with younger participants (n=21; mean age=24.71; SD=2.10) was only investigated with the ETA. The percentage distribution of women was approximately 60% in all three groups. While in the control group all persons own a personal computer, 25% of the persons in the intervention group do not. This value of computer ownership corresponds to the benchmark of older people (up to 70 years) in Germany (Statistisches Bundesamt, 2013). Additionally, 38% of the younger people possess a tablet computer, whereas only 12.5% of the older people own one.

As an indicator for computer literacy, the numbers of hours participants spend at the computer per week were also measured. This indicator is also used in the computer literacy scale by Sengpiel and Dittberner (2008). Regarding this data, the most obvious difference can be seen in computer usage

per week. Older people use their computer, on average, 6.45 hours per week, and younger participants, in comparison, nearly 60 hours per week (see Table 1).

[Table 1. Descriptive statistic sample including computer experience]

| | | *Elderly (n=32)* | | *Junior (n=21)* |
	Overall Sample Elderly	PRA Group (n=15)	ETA Group (n=17)	ETA Group
Age [Mean]	69.84 (SD=6.31)	71.33 (SD=6.63)	68.53 (SD=5,90)	24.71 (SD=2.10)
Number of females	19 (59.38%)	9 (60.00%)	10 (58.82%)	12 (57.10%)
Number of males	13	6	7	9 (42.90%)
Number of people living alone	10 (31.25%)	7 (46.67%)	3 (17.65%)	3 (14.30%)
Number of people with no computer	8 (25%)	4 (26.67%)	4 (23.53%)	0 (0.00%)
Years of computer ownership [Mean]	12.28	11.67	12.82	14.80
Use of computer [Mean h/week]	6.45	7.83	5.22	59.43
Number of people owning a tablet	4 (12.5%)	1 (6.67%)	3 (17.65%)	13 (61.9%)

3.2 Apparatus

The participants will have to use a mock-up of an AAL application. The mock-up was running on the tablet PC Fujitsu Stylistic Q550, 1.70 GHz, 2.00 GB RAM with Windows 7, in order to fulfill three tasks from daily life. It is operated via a touch screen. In a second room, there was another person, and this simulated the service provider for the PRA group. This person used a laptop computer with Windows 7 and a headset for communicating via a video telephone.

3.3 Experimental Design

For the present study, a between-group design was selected. This design seems to be most adequate – otherwise participants would undergo two rounds of the experiment with two treatments with repeated measures (Field & Hole, 2011). As described before, the between-group design splits the sample into an intervention group with PRA and a second group with embedded technical support.

To prevent the occurrence of any systematic differences, the older participants were randomly assigned to their groups. Moreover, a control group with younger participants, who undertook the experiment only with ETA, was analyzed. The measurements were made on the basis of the execution of the experiment (behavioral data) and by an additional questionnaire (for details see 3.5).

3.4 Task Description and Procedure

The three tasks within the experiment are all embedded in situations that may emerge in a household. These scenarios would be manageable with the module "Meine Wohnung" (my home) from the original prototype application (Fraunhofer ISST, 2013). The participant has to solve each task within ten minutes. The AAL application should be used to handle the three situations (for details see Table 2).

[Table 2. Short descriptions of the three scenarios]

Task stove
Imagine you lived in a multi-family house apartment. After having prepared and eaten lunch you are visiting acquaintances from another town. When you arrive, you start to doubt if you have turned off the stove correctly. Recently, there was an article in the news about house fires. All your belongings and your life would be in danger. […]

Task light
Imagine you lived in a detached house. Recently, people have reported burglaries in your neighborhood. As you want to leave your house in order to go on vacation for two weeks, you want the house to appear inhabited by using lights. Thanks to sensors in the lighting system, you can switch different lights on and off in your house as you desire. [...]

Task window
Imagine you are visiting your relatives and you plan to stay overnight at their house due to the long distance. In the evening, you watch the weather forecast on TV and realize that a storm will reach your hometown. You are uncertain whether you closed all of the windows properly or not. The bad weather makes it impossible to return to your home and close the windows manually. [...]

In the stove scenario, the participant's task is to use the mock-up to control whether the stove is turned off correctly. If the stove is still found to be turned on, the task is to turn off the stove. In the light scenario, the participant has to use the application to switch on the lights to simulate being at home. In the third task, the participant should control the window in the bedroom. If the window is still open, the task is to close it.

Figure 1 shows screenshots from the experiment. The start menu, as well as the overview of all the rooms, is used for all of the three tasks. The picture on the right side displays the stove task in the kitchen and the checking operation.
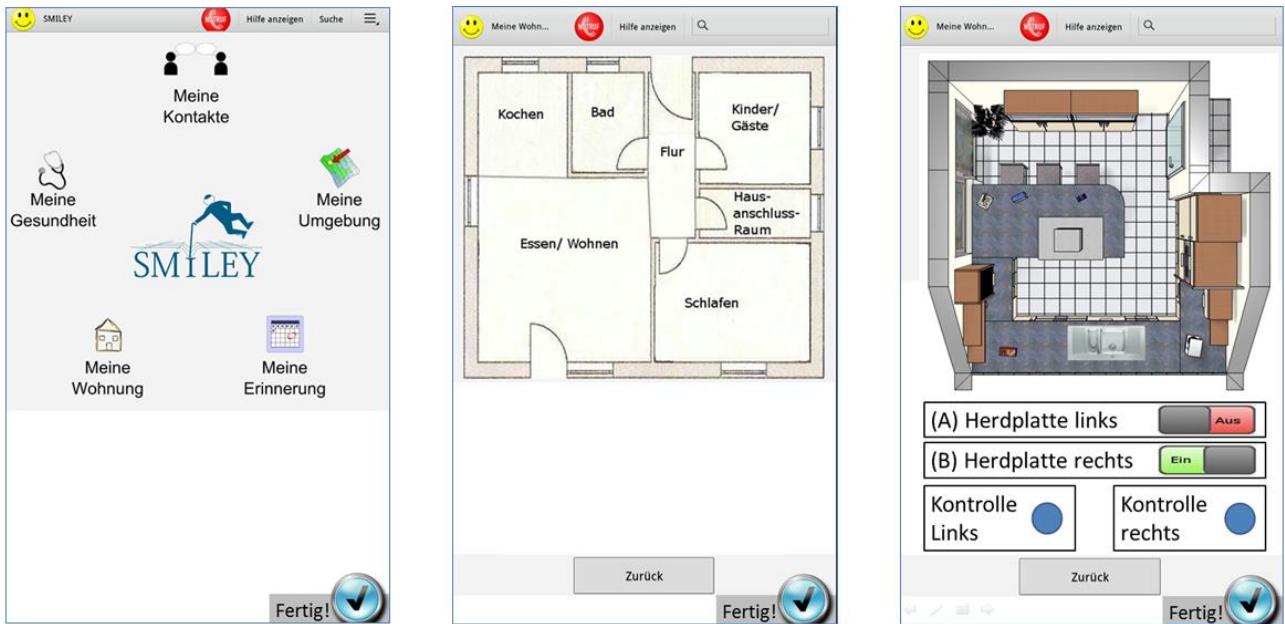
[Figure 1: Screenshots from the AAL mock-up: Start menu (left side); room overview (middle); plan of the kitchen inluding "stove task" (right side)]

All participants have to solve all three tasks: stove, light and window. The measurement of trust via the questionnaire takes place after each task. To prevent the order of tasks affecting the evaluation, the participants are counterbalanced according to a Latin square (Hinkelmann & Kempthorne, 2007; Vogel & Zendler, 2009). By using permutation in the experimental order, it is guaranteed that the participants are equally distributed among the three different task orders (see Ingenhoff, 2012).

The participants are randomly assigned to one of the following two intervention groups:

    i)   Group with PRA

    ii)   Group with ETA

The PRA aims to help the participant fulfill the task in a case where the participant feels insecure about the right handling of the AAL application. The simulated service provider can communicate

with the participant on the AAL application surface by video telephone and can tell the participant where to click, as well as even actively click on the desired icons via remote control. This remote assistance occurred in two ways – as a push-and-pull support. The 'push' support is activated automatically after five minutes. The simulated service provider then appears in the upper-right corner of the display and asks if the participant needs support. The participant decides which way the support will be used. Remote support, as a 'pull' function, can also be activated before the five minutes have expired by saying the keyword "help" in the direction of the tablet computer.

In contrast, the group with ETA only received support by a push function. After 30 seconds, the technical support function highlighted the button, which has to be tapped by the participant. In a case in which the participant does not know which button has to be clicked next, or clicks the wrong button, the technical support gives a hint that the task can be solved successfully. The time until the assistance was initiated automatically resulted from the preliminary study as well as discussions with older people in the context of former studies.

Since the original application was, so far, not capable of being linked to electronic appliances, a "camera view" was integrated into the three experimental tasks. This camera view of stove, lights, and window are in fact pictures, which have been shot before and show the corresponding status. The participants get the information that is parallel to the operation of the application on the tablet computer – the action is accomplished in reality. For example, if the participant turned off the left hotplate, the mock-up displays an image of a left hotplate where the red indicator lamp is off.

In fact, the technology is not performing the task. Nevertheless, to check if the action was finished correctly, the participant is given the opportunity via a "checking operation" which is integrated into the AAL application to monitor the state of the appliance. To prevent the checking button being pushed for reasons of curiosity, additional hurdles are implemented. This artificial barrier consists of four mathematical tasks, which have to be solved in order to receive the camera view. In comparison, Ho et al. (2005) also applied mathematical tasks in their experiments to distract the participants from a medication task. To receive the desired picture of the item, the participant has to

solve four different calculation tasks within each scenario. The calculated numbers work like a transaction number from online banking and thus provide additional security. The arithmetical problems were read to the participant to increase additional barriers again. Furthermore, both of the former mentioned types of assistance were not given in the checking operation, so the participants had to calculate the mathematical tasks by themselves in order to get the camera view. Figure 2 shows a screenshot of the AAL mock-up with personal assistance in the PRA condition as well as the camera view within the stove task.
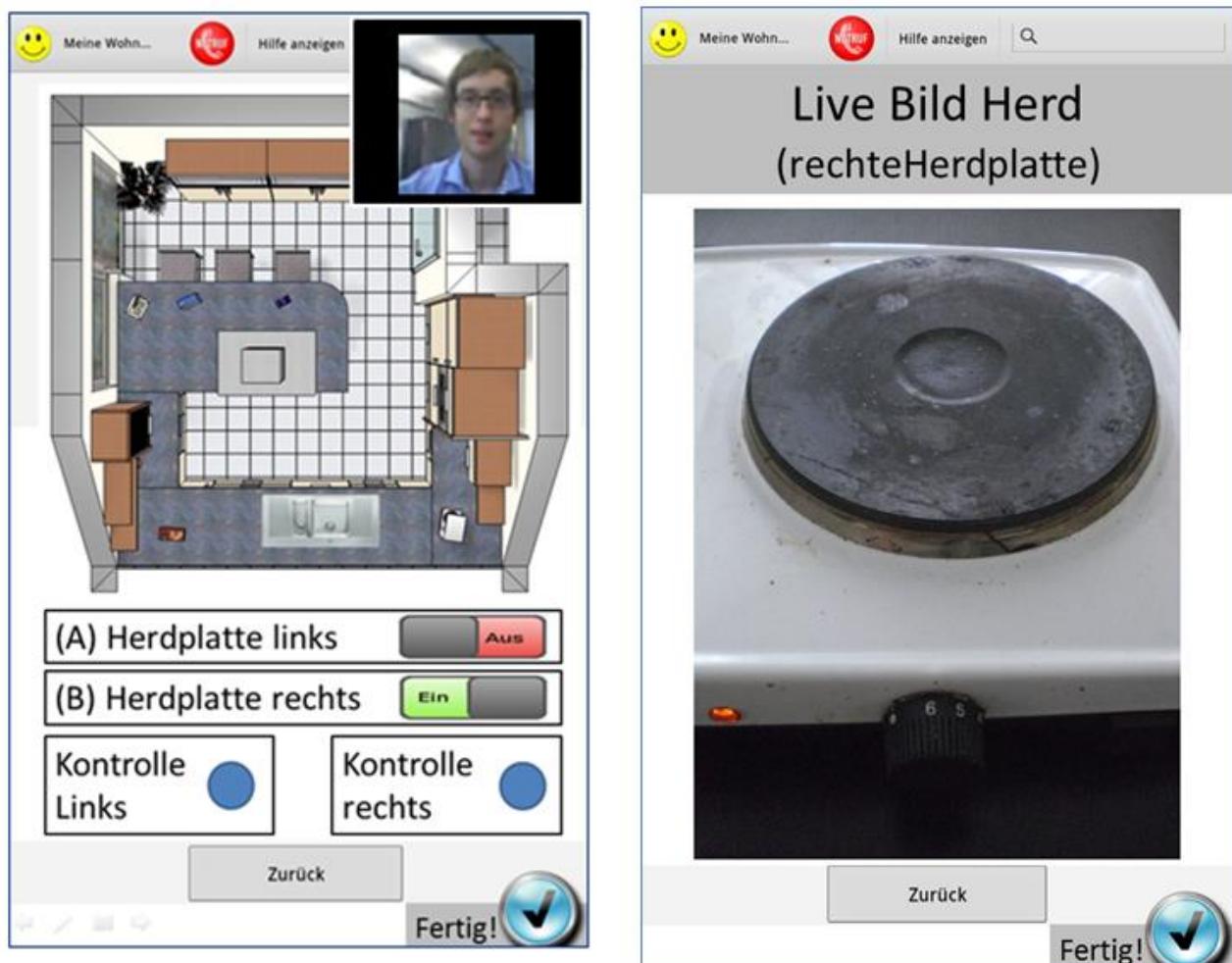
[Figure 2: Screenshots from the AAL mock-up: Personal remote assistance and menu of kitchen (left side); Camera view of the stove (right side).]

3.5 Variables and Measurement

The present study reveals, on the one hand, behavioral data, as well as subjective variables by a questionnaire on the other hand. The participants' performance can be measured by the percentage of task solving, number of clicks per task and the time required per task. Moreover, the number of checking operations, as well as the number of push and pull actions in PRA, are gained by observation. The variable trust in AAL (T_{AAL}) was measured by a questionnaire – derived from the scale by Jian et al. (2000). Since the original scale is written in English, it had to be translated into German. The degree of trust is expressed on a seven-point Likert scale (as in the original version). The results of the study of Steinke et al. (2014) show that the variables – "perceived ease of use" (PEOU), "perceived usefulness" (PU), "expected reliability" (ER) and "intention to use" (IU) – are significantly linked to T_{AAL} (Steinke et al., 2014). With the exception of the variable ER, which is substituted by "perceived reliability" (PR) since participants had evaluated their experiences with AAL reliability in the current experiment, the same questionnaire is used. All of these variables are measured by questionnaire after the experiment. A seven-point Likert scale is applied again.

4. Research Hypotheses

Through the experiment, as well as the participants answering the questionnaire from Steinke et al. (2014), the following seven hypotheses will be investigated. These hypotheses focus on type of assistance, trust in AAL technology, perceived ease of use, intention to use, seniority and its influence among themselves as well as on further variables.

Type of assistance

As described before, the present study differentiates between two types of assistance in the context of an AAL application: PRA and ETA. As seen in the context of interactive voice response systems (IVRs), older people prefer personal interaction and speaking to a real person on telephone hotlines instead of automated computer voices. Moreover, old age influenced performance negatively and usability ratings of IVRs are lower in contrast to younger people (Dulude, 2002). Experiences with

IVRs are also seen as frustrating and unpleasant for older. Furthermore, a guided error training for ticket vending machines shows that video help was better evaluated with reference to type of support and comprehensibility (Struve & Wandke, 2009).

Following these results, in connection with AAL technology, which supports older people in their home environment, it can be assumed that PRA will also be preferred by the end-user in contrast to ETA. In particular, the fact that personal details in case of emergency will be transmitted leads to a stronger need for personal assistance. This social support via PRA may not only be helpful in emergency situations but also in general questions regarding the AAL solution e.g. in cases of battery replacement. Therefore, the main hypothesis is set up as follows:

H1. Trust (a), perceived ease of use (b), intention to use (c) and the amount of solved tasks (d) by elderly people is positively influenced by PRA

Trust in AAL Technology (T_{AAL})

Steinke et al. (2012) defined trust in AAL as "the attitude that an assistive technology supports an impaired person within [its] social environment in an uncertain and vulnerable situation". In the present study, this uncertain situation is described by the three different AAL scenarios in which the participant is put in a worrying situation. As technological systems become increasingly complicated, humans cannot evaluate the true technological capabilities of the system but base their trust level, for example, in which way they interact with the system. Many studies claim that trust in automation is higher than trust in humans (Dijkstra et al. 1998; Dzindolet, 2002; Lee & Moray, 1992; Wiegmann, 2001). In contrast to these results, Lerch et al. (1997) showed that the confidence in a human expert's advice was higher than in an expert computer system. Regarding AAL, the interdependence of technical support by sensors and personnel supported by a human service provider – as a doctor in an emergency situation – clarifies that technical, as well as personal, trust by the end-user has to be available in case of actual usage. Previous results reveal significant connections between perceived ease of use, perceived reliability and perceived usefulness and trust

in AAL technology (Steinke et al., 2014). Furthermore, the link between using the checking operation and trust will be analyzed. Thus, the following hypotheses can be derived:

H2. Trust of elderly persons in AAL technology is positively influenced by perceived ease of use (a), perceived reliability (b), and perceived usefulness (c), but negatively influenced by the number of checking operations (d).

H3. Trust in AAL technology in the overall sample is positively influenced by perceived ease of use (a), perceived reliability (b), perceived usefulness (c), and being elderly (d), but negatively influenced by the number of checking operations (e).

Perceived Ease of Use (PEOU)

Adapting from the Technology Acceptance Model (TAM) by Davis (1989), perceived ease of use can be defined as "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989). User-friendliness and comprehensibility aim people towards acting with technology in the way they want. Particularly, older people have special requirements for technology. The study by Fraunhofer ISST (2013) reveals that, from 50 participants (mean age= 71.0), 90% expect that AAL technology is easy to handle, and 88% expect additional comfort to be useful. A total of 54% have concerns about AAL technology because of the difficult handling (Fraunhofer ISST, 2013). Following this argumentation, solving the tasks in the present experiment will be influenced by perceived ease of use as described in the next hypothesis.

H4. Perceived ease of use in AAL technology is positively influenced by the amount of tasks solved.

Intention to Use (IU)

The behavioral intention to use technology is a well-examined variable within the TAM (Davis, 1989; Ma & Liu, 2004; Schepers & Wetzels, 2007; Yousafzai et al., 2007). Intention to use

characterizes a person's determination, and it is upstream to the actual behavior. As seen in Steinke et al. (2014), intention to use was influenced by variables such as interest in technology, perceived health status and trust in AAL technology. The present paper takes this scenario-based approach and analyzes trust and perceived usefulness as influencing factors on older adults' intention to use in an experimental design. Ghazizadeh et al. (2012) also reveal a significant connection between trust and intention to use in an on-board monitoring system by an extended TAM (Ghazizadeh et al. 2012). Although AAL technology has been explored for the past eight years, a marketable solution is yet to emerge (Steinke et al., 2014). Thus, it is already important to critically question the influence on intention to use. Following the former results, the following hypothesis can be assumed:

H5. Elderly people's intention to use is positively influenced by trust in AAL technology (a) and perceived usefulness (b).

H6. Intention to use in the overall sample is positively influenced by trust in AAL technology (a), perceived usefulness (b) and being elderly (c).

Seniority

To get a better understanding of the differences between younger and older people in the present analysis, it is necessary to take a closer look at the term 'seniority'. There are different age definitions within science. Age is not readily defined by the date of birth; the chronological age of two persons may be equal, but the biological, psychological or social age may differ (WHO, 2011). As seen in the descriptive data, it can be expected that older people have less knowledge of technology, and some of them are not familiar with handling a computer or tablet PC. Due to this fact, Steinke et al. (2014) showed that there is no significant connection between chronological age and trust, as well as intention to use, and in the present study an additional separation of younger

and older people is investigated. The differentiation between the intervention and control groups regarding PEOU and PU will be analyzed by the following hypothesis:

H7. Perceived ease of use (a) and perceived usefulness (b) are positively influenced by being elderly.

5. Results

The following section gives an overview of the results of the study. First, behavioral data, as a percentage of task solving and investment of time for the different tasks, will be analyzed. Thereby, a major focus lies in the differentiation between PRA and ETA in the intervention group – as well as the comparison with the younger people in the control group. Afterwards, the results from the different variables from the questionnaire will be analyzed. The analysis will be conducted using descriptive statistics as well as ANOVAs and Ordinary Least Squares (OLS) regressions.

5.1 Behavioral Data

Task Processing

The first evaluation shows the percentages of tasks solved in the different scenarios as well as the number of participants who received assistance via push or pull actions. As seen in Table 3, in the intervention group, 80% of the test persons solved the "stove" task, 73.3% solved the "window" task, and 66.7% solved the "lamp" task correctly. Each of the 21 younger people of the control group solved the stove and window tasks, and 76.2% solved the lamp task correctly. Errors in task processing occurred, e.g. due to participants' misunderstanding the task. Furthermore, some of the participants had difficulties handling the tablet. Unsuccessful task solving can result from pushing the finish button prematurely or from not finishing the task within ten minutes (e.g. not solving the optional checking operation in time).

[Table 3. Data of successful solved tasks and received assistance among the three scenarios]

	Elderly (n=32)		Younger (n=21)
	PRA Group (n=15) % (number of participants)	ETA Group (n=17) % (number of participants)	ETA Group % (number of participants)
Stove	80.0 (12)	41.2 (7)	100 (21)
Lamp	66.7 (10)	29.4 (5)	76.2 (16)
Window	73.3 (11)	35.3 (6)	100 (21)

It should be mentioned that only approximately 53% of the people with personal support, and 12% of participants with technical support, solved all of the tasks correctly. More than 76% of the junior control group solved all of the tasks.

Moreover, there are some mentionable correlations regarding the successful completion of the scenarios. First, elderly people gained experience of solving the tasks during the experiment. While 50% of the participants correctly solved their first and second task, 59.4% solved the third task. Second, solving one task is positively correlated with solving the other tasks as well. On the other hand, task solving is positively correlated with T_{AAL} (corr=.314), PEOU (corr=.636, p<.01), PU (corr=.122), PR (corr=.277), and IU (corr=.213)

An ANOVA is conducted for the question of whether an elderly participant, who successfully solves the tasks, differs in his/her evaluation regarding T_{AAL}, IU, PEOU, PU, and PR. For this analysis, two different assumptions are applied:

i)   successful task solving means solving at least two tasks successfully;

ii)   successful task solving will be defined as having solved all tasks successfully.

Those who succeeded in "solving at least two tasks correctly" differ from those who did not – considering T_{AAL} (p<.05) and PEOU (p<.005), but not regarding IU, PU, and PR. On the other hand, when defining task solving as solving all tasks correctly, only between-group differences in the evaluation of PEOU (p<.05) are significant, indicating that solving a task increases the subjective perceived ease of use. Furthermore, when considering PRA and ETA, participants

receiving PRA differ in their probability of solving the tasks when compared to those with ETA (p<.01).

Number of Clicks and Investment of Time

Table 4 shows the differences of the average actual clicks between the three scenarios and the different experimental groups. The number of clicks was measured for each task until the participant had finished the task by clicking on the finish button or the task was automatically finished after 10 minutes – in both cases no matter if the tasks were solved correctly. The minimum number of clicks, which is calculated for the direct way to solve the tasks, is five clicks for the window task, six clicks for the stove task and nine clicks for the lamp task. Regarding usage of the checking operation, the minimum number increases to 14 clicks in the window scenario and 24 and 27 clicks in the stove and lamp scenarios, respectively. The reason for this difference in minimum clicks is, on the one hand, the fact that the window scenario required only one action to be performed (closing one window), and the other two scenarios required two actions. On the other hand, there was a slight variation in each room to avoid the participants falling into a pattern. The minimum number of clicks was equal for PRA and ETA.

The intervention group with PRA shows the range of the average actual number of clicks from 22.7 (window) to 35.6 (lamp). In contrast, older participants with ETA needed, on average, 24.6 (lamp) to 31.8 (stove) clicks until the end of the task. The number of average clicks in the control group ranged from 10.2 (window) to 15.5 (lamp). The number of minimum clicks by the older participants was between 6 (window) and 12 (lamp). In contrast, the maximum clicks ranged between 89 (window) and 136 (lamp). The control group reached a maximum number of clicks from 19 (stove) to 44 (lamp).

[Table 4. Number of clicks among the three scenarios]

	Elderly (n=32)				Younger (n=21)	
	PRA Group (n=15)		ETA Group (n=17)		ETA Group	
	Mean	Min./Max.	Mean	Min./Max.	Mean	Min./Max.
Stove	34.9	7/123	31.8	10/73	11.3	6/19
Lamp	35.6	12/136	24.6	11/60	15.5	9/44
Window	22.7	6/89	27.0	9/69	10.2	5/26

As mentioned before, through the number of measured clicks, in this descriptive evaluation regarding the duration, participants did not necessarily answer the tasks correctly. They pressed the "finish" button or the time of 10 minutes elapsed. As seen in Table 5 below, there are also differences in the average times required by the intervention and control groups to finish the tasks. The younger control group needed around two minutes, on average, before pushing the finish button, and the intervention group with ETA, required between five and six minutes. The average duration with PRA is from 4.0 (window) to 5.1 (lamp) minutes.

[Table 5. Average duration for finalizing the three scenarios among the three scenarios – in minutes]

	Elderly (n=32)		*Younger (n=21)*
	PRA Group (n=15)	ETA Group (n=17)	ETA Group
Stove	4.9	5.4	2.19
Lamp	5.1	5.1	1.8
Window	4.0	5.7	1.7

Regarding the number of clicks a person needed in order to solve a task, the analysis revealed several interesting results. First, no reduction of clicks was observed. Elderly participants, on average, executed 29.68 (SD=23.11) clicks to solve their first task. For the second and third task, 28.23 (SD=24.00) and 29.94 (SD=20.00) clicks were executed, respectively. Second, the number of clicks was negatively correlated with the experience the participants had with computers and tablet PCs. Third, the number of clicks was positively correlated with the time needed, and negatively correlated with the correct solution of tasks. Fourth, the mean number of clicks was positively (but not significantly) correlated with the evaluation of the technology, i.e. with T_{AAL} (corr=.185), PEOU (corr=.209), PU (corr=.209), PR (corr=.225), and IU (corr=.157). This indicates that people who executed a higher number of clicks (e.g., because they had problems with solving the tasks or because they used the checking operation) generally had a higher opinion of T_{AAL}, PEOU, PU, PR, and IU.

With respect to the time needed to solve each task, the analysis revealed a negative correlation with the correct solution of the tasks (correlations up to $-.43$). Second, the longer the participant needed the higher he/she evaluated the technology, i.e., the time needed for solving the tasks is often (though not significantly) positively correlated with T_{AAL} (corr=.090), PU (corr=.268), PR (corr=.134), and IU (corr=.288).

Checking Operation

In order to find out whether checking for a correctly working system (clicking on the checking button) influences the evaluation of the system or not, it has to be differentiated between several definitions of checking. In each scenario, data was collected about whether the participant started the checking operation and whether he/she finished it. Finishing the operation means that four different arithmetical problems were solved correctly by the participant and the camera view was displayed. Two reasonable definitions of using the checking operation are then analyzed. Checking as a variable is defined as:

i) participants having started the check, but without finishing at least one scenario;

ii) successfully executing the checking operation until the end of at least one scenario.

The share of participants starting or executing the checking operation can be found in Table 6.

[Table 6. Share of participants starting or executing the checking operation]

Task	Elderly (n=32)				Younger (n=21)	
	PRA Group (n=15)		ETA Group (n=17)		ETA Group	
	Started	Executed	Started	Executed	Started	Executed
Stove	35.3%	29.4%	40.0%	26.7%	38.1%	19.0%
Lamp	41.2%	11.8%	26.7%	20.0%	19.0%	9.5%
Window	17.6%	52.9%	33.3%	20.0%	28.6%	14.3%

Following the results, the relevance of the additional checking operation is highlighted. The correlation analysis regarding the checking operation revealed several important aspects. First, using the checking operation for a working system in one of the three scenarios correlates with

checking this function in other scenarios as well (correlations between .34 and .61). Second, checking is not always correlated positively with solving the tasks correctly – sometimes even negative correlations appear (non-significant correlations ranging from −.030 to .129). Third, neither T_{AAL} nor PU, PR, and IU show a significantly positive relationship with checking for a working system (correlations ranging from −.056 to .381). For the senior sample, a significant correlation of .381 (p<.05) between starting the checking operation and T_{AAL} was revealed. Executing the checking operation successfully was non-significant – as well as the correlations in these two relations for the overall sample. The ANOVA reveals trust differences between participants starting the check and those who do not start the check (p<.05) as well as differences between those finishing the check and those not finishing it (p<.01).

5.2 Questionnaire Data

After analyzing the behavioral data from the experiment, the variables – which are requested via the questionnaire in the case of T_{AAL} after each scenario, and PEOU, PU, PR and IU after the overall experiment – are investigated. Table 7 gives a visual overview of the mean values in the questionnaire resulting from the experiment.

[Table 7. Descriptive analysis by mean values*]

Table 7. Descriptive analysis by mean values*

		Elderly (n=32)		*Younger (n=21)*
	Overall Sample Elderly	PRA Group (n=15)	ETA Group (n=17)	ETA Group
T_{AAL}	5.74	5.99	5.52	5.53
PEOU	4.73	5.50	4.05	6.00
PU	5.46	5.40	5.51	4.57
PR	5.39	5.61	5.20	5.02
IU	5.50	5.58	5.43	4.97

Note: T_{AAL}: Trust in AAL; PEOU: Perceived Ease of Use; PU: Perceived Usefulness; PR: Perceived Reliability; IU: Intention to Use

The results of T_{AAL} in the three different scenarios (stove, lamp and window) are considered. All three tasks were evaluated by the maximum possible measure of seven by at least one person. The minimum measures vary to a large extent between the groups. The means of T_{AAL} in the stove, lamp and window tasks are 5.89 (SD=1.01), 5.65 (SD=1.23) and 5.67 (SD=1.09), respectively.

In order to evaluate trust as a single variable, for further analysis the three single items from the different AAL scenarios are merged to their total mean score, which represents the overall trust in the AAL application. In consequence, no further differentiated analysis of the three different scenarios will take place. The accumulated trust mean score of the elderly is 5.74 – with a standard deviation of 1.03. The perceived ease of use of the technology was evaluated with an average value of 4.72 (SD=1.64). The value of perceived usefulness was, on average, 5.46 (SD=1.18), that of perceived reliability 5.39 (SD=1.20), and the value of intention to use 5.50 (SD=1.40).

To find out whether differences in the perception of older people between PRA and ETA exist or not, an ANOVA is executed for the variables T_{AAL}, PEOU, PU, PR and IU while distinguishing between persons with PRA and ETA. The only variable in the present experiment significantly influenced by PRA is PEOU ($p<.05$). The other variables – T_{AAL}, PU, PR and IU – are not significantly influenced by PRA (see Table 8).

[Table 8. ANOVA regarding PRA (Senior Sample)]

		Sum of Squares	df	Mean Square	F	Sig.
T_{AAL}	Between Groups	1.798	1	1.798	1.743	.197
	Within Groups	30.959	30	1.032		
	Total	32.757	31			
PEOU	Between Groups	16.635	1	16.635	7.525	.010
	Within Groups	66.319	30	2.211		
	Total	82.953	31			
PU	Between Groups	.101	1	.101	.070	.793
	Within Groups	43.113	30	1.437		
	Total	43.214	31			
PR	Between Groups	1.387	1	1.387	.960	.335
	Within Groups	43.355	30	1.445		
	Total	44.742	31			
IU	Between Groups	.171	1	.171	.084	.774
	Within Groups	60.940	30	2.031		
	Total	61.111	31			

Note: T_{AAL}: Trust in AAL; PEOU: Perceived Ease of Use; PU: Perceived Usefulness; PR: Perceived Reliability; IU: Intention to Use

To indicate the influence of PEOU, PU, and PR on T_{AAL} − based on the results by Steinke et al. (2014) − a multiple regression was conducted with T_{AAL} as dependent, and PEOU, PU, and PR as independent, variables (Table 9), which on a 5% level revealed a significant influence of PR and PEOU on T_{AAL}. The multiple regression regarding IU as the dependent, and T_{AAL}, PEOU, PU, and PR as independent, variables reveals that PU ($p<.001$) is the only variable significantly influencing IU (Table 10).

Table 9. Regression on T_{AAL} (Senior Sample)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.601	.731		4.928	<.001
	PEOU	.254	.104	.404	2.439	.021
	PU	-.311	.196	-.357	-1.588	.124
	PR	.489	.210	.571	2.323	.028

Note: PEOU: Perceived Ease of Use; PU: Perceived Usefulness; PR: Perceived Reliability

Table 10. Regression on IU (Senior Sample)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.132	1.184		.112	.912
	PEOU	.156	.136	.181	1.146	.262
	PU	1.014	.243	.853	4.178	<.001
	PR	-.288	.273	-.246	-1.057	.300
	T_{AAL}	.113	.224	.083	.504	.618

Note: PEOU: Perceived Ease of Use; PU: Perceived Usefulness; PR: Perceived Reliability

After analyzing the data of the intervention group, the question arises as to what extent the sample of the younger participants differs from that of the elderly. Hence, the following results show the differentiation between the younger and older participants. Considering the variables PEOU ($F(1,51)=10.176$, $p<.005$) and PU ($F(1,51)=7.426$, $p<.01$) there is a significant difference between younger and older participants. On the other hand, T_{AAL}, PR, and IU do not significantly differ across both age groups. Moreover, the correlations between being elderly and PEOU is −.408 ($p<.001$) and between being elderly and PU is 0.357 ($p<.001$).

Moreover, regression analyses are conducted for the overall sample regarding the variables' influence on T_{AAL} and IU. The results of the regression analysis further reveal that PEOU and PR are significant indicators (p<.05 and p<.005, respectively) for T_{AAL} in the total sample. Considering IU, the total sample results indicate that only PU is influential on IU (p<.001) while T_{AAL}, PEOU, and PR are not.

6. Discussion

The present article differentiates between PRA and ETA as forms of support in an experiment with an AAL mock-up. These two types of assistance help the participants to solve the experimental tasks. Despite the fact that the ETA highlights the button which the participant is required to push on the tablet computer, and thus functions 100% reliably in this experiment, the elderly preferred the PRA. Perceived ease of use is positively influenced by PRA – thus, hypothesis H1b can be verified (all hypotheses can be seen again in Table 11). The reason could be the low number of older people who already had experience with tablet computers. Only 4 of the 32 participants are owners of a tablet computer – and only one in the PRA group. Therefore, support by a human operator, even if it is through a video telephone, seems to be more comfortable than technical support by highlighted buttons alone.

Despite these positive results, neither the correlation between trust and PRA, nor those of intention to use and PRA, are statistically significant (H1a and H1c can be rejected). This means that the main research question – *Does a significant relationship exist between elderly people's trust and the type of assistance integrated in an AAL application?* – can be answered with a "no". There is a positive correlation, but not statistically significant, which could be substantiated by the small sample size.

The fact that approximately 53% of the older people with PRA, but only 12% of participants with ETA, solved all of the tasks correctly shows a huge difference between the two assistance types. The amount of solved tasks is positively influenced by PRA (H1d can be verified). For the overall

sample, perceived ease of use is significantly linked to the number of solved tasks (H4 can be verified). This indicates that PRA, integrated into AAL technology, could be an important factor in increasing user-friendliness. Consequently, this could be used as a marketing opportunity for AAL to lead more people towards buying this technology.

Table 11. Hypothesis test

	Hypothesis	Support
Results from senior sample		
H1a	Trust in AAL is positively influenced by PRA	No
H1b	Perceived ease of use is positively influenced by PRA	Yes
H1c H1d	Intention to use is positively influenced by PRA	No
H2a	Amount of solved tasks is positively influenced by PRA	Yes
H2b	Trust in AAL is positively influenced by perceived ease of use	Yes
H2c	Trust in AAL is positively influenced by perceived reliability	Yes
H2d	Trust in AAL is positively influenced by perceived usefulness	No
H4	Trust in AAL is negatively influenced by the number of checking operations	No
H5a	Perceived ease of use is positively influenced by amount of tasks solved	Yes
H5b	Intention to use is positively influenced by trust in AAL	No
	Intention to use is positively influenced by perceived usefulness	Yes
Results from overall sample		
H3a	Trust in AAL is positively influenced by perceived ease of use	Yes
H3b	Trust in AAL is positively influenced by perceived reliability	Yes
H3c	Trust in AAL is positively influenced by perceived usefulness	No
H3d	Trust in AAL is positively influenced by being elderly	No
H3e	Trust in AAL is negatively influenced by the number of checking operations	No
H6a	Intention to use is positively influenced by trust in AAL	No
H6b	Intention to use is positively influenced by perceived usefulness	Yes
H6c	Intention to use is positively influenced by being elderly	No
H7a	Perceived ease of use is positively influenced by being elderly	No
H7b	Perceived usefulness is positively influenced by being elderly	Yes

Regarding trust in AAL technology, results from the previous study by Steinke et al. (2014) can be partly confirmed. Perceived ease of use, as well as perceived reliability, significantly influences trust of older people. There seems to be a consistent connection between these variables in the context of AAL (H2a and H2b can be verified). The connection between perceived usefulness and trust differs from the former study as it is not significant (H2c can be rejected). The findings for the overall sample underline the statements from the senior sample. Trust is positively influenced by

perceived ease of use and perceived reliability but not by perceived usefulness (see H3a to H3c). Furthermore, there is no significant influence on trust from being elderly (H3d can be rejected).

Furthermore, results underline that people using the checking operation in order to be sure the technology works correctly do not significantly differ in their evaluations of the technology from those people who do not check. This indicates that a checking operation in this experiment does not specifically address "skeptical" (e.g., low-trust) people. The senior sample shows a positive and significant correlation between starting the checking operation, in at least one scenario, and trust. Additionally, there was a non-significant positive connection between executing the checking operation successfully in at least one scenario and trust (thus, H2d and H3e can be rejected). To further analyze the added value of a checking operation, people need to be aware that actual reliability of AAL technology may not be 100% – this will be especially analyzed in a following experiment.

In contrast to the results found in Steinke et al. (2014), intention to use does not significantly influence trust in the senior sample (H5a can be rejected). Besides, the overall sample reveals no significant influence of participants' trust in AAL technology and intention to use (H6a can be rejected). The missing significance could be the result of the relatively small sample size. Moreover, intention to use is not significantly influenced by seniority (thus, H6c can also be rejected). In accordance with the previous study, intention to use is positively influenced by perceived usefulness in the senior sample and additionally in the overall sample (H5b and H6b can be verified). Regarding the significance of seniority on perceived usefulness and perceived ease of use, it can be seen that there are opposite effects. Perceived ease of use was negatively influenced by being elderly, meaning that younger people have a higher perception of the user-friendliness of the mock-up on the tablet computer than older people (H7a can be rejected). The perceived usefulness of the AAL technology was significantly higher in the senior sample (therefore, H7b can be verified). A qualitative evaluation of the experiment demonstrates that participants, especially those who had difficulties operating the tablet PC, avoided or aborted the checking operation. Some

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of them did not understand the added value of calculating mathematic tasks or how to accomplish an entire cycle. Others who started the checking operation reported that they finished the whole round correctly even if they had not. In particular, participants with higher computer experience showed a higher number of checking operations, which could also have been caused by curiosity about the camera picture. The participants were, overall, really interested in innovative technology, and some blamed themselves for the fact that they had insufficient previous experience with the tablet computer used in the experiment. Compared to the average of the older people, the intervention group had a high affinity for technology. Low usability, or a lack of usefulness, could have even greater effects in terms of trust or intention to use AAL if people had a lower affinity for technology.

In summary, the results referring to the senior sample reveal similarities, as well as differences, with the former study. Trust in AAL technology is influenced by ease of use and perceived reliability. These findings, as well as the link between perceived usefulness and intention to use, cover the conclusion from Steinke et al (2014). According to this study, the connection between trust and intention to use AAL technology could not be proved. An interesting fact about the PRA can be found by taking a closer look at the influence on perceived ease of use, whereas trust and PRA in AAL are not directly connected. Hence, the main research question – as to whether a significant relationship exists between the type of assistance and trust of elderly persons – has to be rejected.

7. Limitations

Regarding the present experiments, some limitations should be mentioned. First of all, the participation was voluntary and older participants were addressed by information through flyers, telephone calls or personal contact. Thus, the motivation for participation may have been curiosity about AAL technology or new technologies in general.

Second, 12.5% of the older participants in this sample possess a tablet computer which shows a high technology affinity. This fact could lead to a bias in the performance of the experiment or

responses to the questionnaire. In contrast to this statement, some of the older adults also reported that, despite of the introductory exercise, they did not know how to click correctly on the tablet. Moreover, the younger participants use their computer nearly 60 hours per week, which reveals a very high computer experience in the control group.

Third, due to the small number of participants in the intervention and control groups, the results of the multiple regressions, as well as those from ANOVAs, are difficult to compare. Since preparation and implementation of the experiment were very time consuming, it will be challenging to get a larger sample, which would be necessary for a more accurate analysis.

Fourth, the answers of the participants may be influenced by giving socially desirable responses. As can be seen in the study by Dunn (2009), in an interview situation, people tend to give answers that do not reflect their opinion, but what they perceive to be normal. Since the participants only knew that the experiment was about innovative technologies, they might have thought that an expected answer is to be open towards new technology and rate with high values.

Fifth, due to technological restrictions, only applications from the field of households could be tested. Although the tasks seem trivial, participants had to navigate within an application, which is completely new to them. Furthermore, to gain broader and more generalizable results, applications from other fields of AAL also have to be tested.

8. Further Research

To support the findings from the present, as well as previous studies regarding trust and other influencing factors on AAL technology, it would be valuable to operate further investigations. To underline the relevance of PRA for older persons, further research in the context of AAL technology should be performed. Moreover, different additional delimitations of remote support could be tested: voice calls, video and voice telephones, or remote support without a telephone. All of these technical differences in personal support could influence variables such as perceived ease of use, trust and intention to use AAL. Experiments could also be conducted in rural areas, in which

older people, who are living alone at home, could see AAL technology in a different way when compared to those living alone in larger cities.

Perceived reliability will be highlighted in the next experiment. The investigated AAL mock-up in this present study is 100% reliable, which represents the ideal case of actual reliability in technology. In a further examination, a manipulation of three different levels of reliability is undertaken. An error on the display will indicate to the participants that the action was not successful. This following study, which also analyzes the virtual home environment via a mock-up, should investigate manipulated and perceived reliability as crucial factors for the measured high-trust values in AAL. Another important survey type in connection with AAL would be a long-term study in a real-life environment of older persons. The aim of this study – trust development over time, learning effects and the performance of sensors and actors in daily use – can be examined. The handling of AAL technology by the elderly in a long-term study could be important for the design of AAL by developers and acquiring a deeper understanding of the end-user through academic research.

Acknowledgement

Biographies

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Tobias Fritsch, PhD, completed his Doctoral Thesis in Computer Science at Freie Universität Berlin, Germany. Currently he is at Ruprecht-Karls-Universität Heidelberg, Germany, and the main emphasis of his research concentrates on social networking activities with a specific focus on the integration of the elderly population.

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Figure legend

Figure 1: Screenshot from the AAL mock-up

Figure 2: Screenshot from the AAL mock-up

Table legend

Table 1. Descriptive statistic sample including computer experience

Table 2. Short descriptions of the three scenarios

Table 3. Data of successful solved tasks and received assistance among the three scenarios

Table 4. Number of clicks among the three scenarios

Table 5. Average duration for finalizing the three scenarios among the three scenarios – in minutes

Table 6. Share of participants starting or executing the checking operation

Table 7. Descriptive analysis by mean values

Table 8. ANOVA regarding PRA (Senior Sample)

Table 9. Regression on T_{AAL} (Senior Sample)

Table 10. Regression on IU (Senior Sample)

Table 11. Hypothesis test