HoCare
Interreg Europe

DIGITAL INCLUSION AND ACTIVE AGEING – DEVELOPING A USER-CENTRED METHODOLOGICAL APPROACH TO INVESTIGATE THE USE OF MOBILE PHONES AMONG OLDER PEOPLE

GOOD PRACTICE - PROJECT

European Union
European Regional Development Fund

Contents

Introduction to the Good Practice:

Slovenian Research Agency and second largest Slovenian telecommunication operator Simobil are co-financing an applied research project titled "Digital inclusion and active ageing: Developing a user-centered methodological approach to investigate the use of mobile phones among older people". The project is run by Centre for Social Informatics, Faculty of Social Sciences, University of Ljubljana. The project was not funded through Operational Programme.

Problem:

The need of older adults to live at home for as long as possible, increasing costs of long-term care (leading to unsustainable health and social care systems), and burdened informal carers can nowadays no longer be ignored. These characteristics of an ageing society are pressuring policy makers, industry, researchers, and civil society organizations to develop and mainstream ICT-based assistive services (ASs). Despite the growing body of evidence about ICT-based ASs' positive effects, Slovenia is in its infancy regarding the adoption of smart solutions for active and healthy ageing.

Solution:

Development of an original iterative and mixed-methods methodological approach to design, development and implementation of consumer technologies for older people, which is based on principles of user-centered design, participation and integration. This robust model is titled „three stages of user involvement " and is involving end users – older adults and informal carers – in three stages of the research and innovation process: (1) eliciting user needs and generating design ideas; (2) evaluating selected mobile application in lab setting and real environment and generating redesign ideas; and (3) evaluating redesign ideas. The project is closely connected to the home care through studying the ATs integrated in smartphones that can improve the quality of life of older adults and enable them to live in their own homes as independent and as long as possible.

Impact:

The project develops an integrated theory-driven and evidence-based approach in

order to stimulate the uptake of technological solutions for active and healthy ageing for a "triple-win" outcome: 1) improved wellbeing of older adults and their informal carers; 2) financial gains for the health and social care sectors; 3) new market opportunities for providers of mobile services.

By establishing a methodology of participatory user-centered design of ATs integrated in mobile phone applications, the project has an important impact on the methodological advances for design, development, and evaluation of new ICTs. Namely, this methodological approach for studying the needs, use, usability and benefits related to (ATs integrated in) mobile phones is quite robust and could thus be (and has been) applied by other companies (with research departments or outsourced research agencies) and researchers. Papers with more details about this robust methodological approach were presented at the conference in Slovenia and published in the conference's proceedings and in journals.

Since the start of this project University of Ljubljana (Centre for Social Informatics at the Faculty of Social Sciences) also received expression of interest for cooperation with more Slovenian companies (Telekom, Smart Com, Marand), as well as a Dutch company (GoCiety) who are all developing market-ready e-care and/or e-health solutions and want to co-create their services through intense user involvement. Centre for Social Informatics is currently also involved in several H2020 proposal developments for different calls and in all consortia their role is to adapt, further develop and apply their 3-staged model of user involvement.

1. Relevancy of the GP project

The "Relevancy of the GP project" section provides quick check and definition of its relevancy in regards to HoCare project objectives.

Good practice of quadruple-helix cooperation in R&I?	Yes, this GP project includes good practices of quadruple-helix cooperation in R&I
Good practice of delivery of Home Care R&I?	No, this GP project does not include good practices of delivery of Home Care R&I.
If not in Home Care R&I, describtion and proof of its potential for transferability to delivery of Home Care R&I	The project does not include good practices of delivery Home Care R&I directly. Anyway, the project is closely connected to the home care through studying the assisstive technologies integrated in smartphones that can improve the quality of life of older adults and enable them to live in their own homes as independent and as long as possible. Moreover, the project implemented innovative and robust model titled „three stages of user involvement ", involving end users – older adults – in three stages of the research and innovation process – eliciting user needs and generating design ideas; evaluating selected mobile application in lab setting and real environment and generating redesign ideas; and evaluating redesign ideas.
Generation of innovation in home care through answering unmet needs identified by formal or informal healthcare providers?	Yes, this GP project includes good practices of innovation through answering unmet needs.
Generation of innovation in home care through public driven innovation?	No, this GP project does not include good practices of public driven innovation.
Generation of innovation in home care via quadruple-helix cooperation for quicker delivery to the market?	Yes, this GP project includes good practices of innovation via cooperation for quicker delivery to the market.

2. Quick overview of the GP project

The "Quick overview of the GP project" section provides initial overview of the good practice project (GP project) and enables readers to see if this GP project idea is relevant for possible transfer to their organization potential innovation activities.

Name of the GP project	Digital inclusion and active ageing: Developing a user-centered methodological approach to investigate the use of mobile phones among older people
Region of origin of GP project	Slovenia
5 keywords that best describe the content of the GP project	active ageing, quality of life, user-centred design, mobile phones, assistive technology
Relevant **Operational Programme name through which the GP project has been funded** (+ also in local language in brackets)	The project is funded by Slovenian Research Agency and Simobil, second largest telecommunication operator in Slovenia as an applied research project and not through Operational Programme.
Relevant **support programme / intervention area name** of the GP project **through which it was funded** (+ also in local language in brackets)	/
Single or multiple recipients of the GP project?	single recipient
Type of lead recipient (SME, LME, research centre, innovation centre, network/association, university/school, municipality, other public body, other (specify)	Research centre, university
Types of participating partners (list all participating partner types.	Large enterprise Public institution – research actor National (governmental) agency

E.g.: hospital, social house, senior house, patient association, networks, SMEs, LMEs, research actors, business supporting organizations, public institutions/regulators, other (specify)	Civil society
Summary of the good practice	Contemporary societies are facing two striking trends: widespread population ageing and rapid diffusion of information and communication technologies (ICTs). Since old age often implies ailing health and social isolation, societies could embrace the advances in ICTs to enhance social integration, health and active ageing. However, the complexity and novelty of ICTs threaten many older people with exclusion from their use. Older people could be offered e-services, which would improve their quality of life, if based on age friendly design. Although digital inclusion is strongly advocated in the EU research and policy strategies and associated with positive outcomes such as high quality of life for older people, and new market opportunities for ICT system providers, the uptake of assistive technologies (ATs) among elderly is slow-moving.
	In this context, mobile phones (MPs) represent an opportunity for digital inclusion due to their already widespread use among the elderly. Therefore, the project is directed towards studying socio-technical affordances of ATs in mobile phones to foster inclusive and empowered ageing of the heterogeneous group of the elderly.
	The project is original on the conceptual and methodological level:
	• (based on the integration of technology acceptance models and theory of person-environment exchange processes) an eco-gerontechnological model was developed which enables a holistic conceptual link between ageing well and acceptance of mobile applications among older people;
	• (based on adaptation of the Experience and Application Research and human-centred design process - ISO 9241) a user-focused, participative, iterative, context-aware, mixed-methods and age-friendly methodological approach for studying the needs, use, usability and benefits related to mobile phones was developed.
	Other main results of the project are as follows:

	- The identification and empirical evaluation of crucial factors (i.e., personal and environmental characteristics, exchange processes) that should be considered when designing mobile services that contribute to subjective and objective dimensions of quality of life of older people.
	- Development of detailed user profiles based on a segmentation of older (non)users of different types of mobile phones that will be based on the study of lifestyles, needs and motives for usage of mobile phones, integration in the social environments, personal characteristics, etc.
	- Benchmarking and usability, accessibility and scalability analysis of existing ATs and mobile phones' services for older people.
	- Development of (a) paper prototype(s) of optimal mobile application(s), its evaluation and study of its implementation among the potential end-users.
	The project brings together over two decades of internationally recognized interdisciplinary research by the project team in areas of (a) social informatics, (b) social science methodology, including mixed-methods data collection and evaluation designs for elderly, (c) gerontology, (d) experience with large international (FP5, FP6, FP7, COST Actions, LLP, Interreg) empirical digital inclusion projects and (e) developments of web applications for elderly (online learning games).
	The core research team tightly cooperates with research unit at Simobil, the second largest mobile phone carrier and the co-funding partner in the project, which – as a member of Telekom Austria Group – has a recognized group of experts specialized in usability testing of mobile services. With the participation of world-leading scholars in the abovementioned fields the project is expected to contribute to a global breakthrough in the integration and business exploitation of assistive and mobile services.

3. Transferability

The "Transferability" section provides more detailed review of strengths and weaknesses of this GP project including description of necessary basic conditions for region and leading organization to potentially transfer it. At the end of the section, the key threats in the successful transfer open up possibility to focus on specific relevant issues important for the successful transfer.

Strengths and weaknesses of the project

What are the GP project	- Addressing demographic trend of rapid population ageing.

strengths? Why it was funded?	• Addressing one of the most intriguing questions regarding the social impact of new technologies – how the acceptance and use of ICTs and ICT-based services is related to questions of social inclusion, social cohesion, social capital, and other important aspects of a healthy, democratic and just society. • Development of an original methodological approach to design, development and implementation of consumer technologies for older people, which is based on principles of user-centered design, participation and integration.
What are the **key weaknesses of the GP project**?	• Project and development of methodological approach may not meet the needs of all segments of heterogeneous older population. • Some groups of older adults may not be able to use smartphones and apps with assistive services and thus are excluded from the benefits from their usage (oldest older adults, those with disabilities, the poorest …). • A lot of time and resources are needed for successful implementation of all three phases of the three-staged model of user involvement.

Basic conditions for successful transfer

Why is this GP project transferable?– innovation, impact, financial, legal, and timeframe aspects	**INNOVATION** The project introduces an innovative methical approach that comprehensively explains the relationship between the socio-psychological needs of older people and their technology design preferences. An eco-gerontechnological model was developed which enables a holistic conceptual link between ageing well and acceptance of mobile applications among older people. Moreover, innovativeness of the project as a whole lies in an user-focused, participative, iterative, context-aware, mixed-methods and age-friendly methodological approach for studying the needs, use, usability and benefits related to mobile phones. This methodological approach for studying the needs, use, usability and benefits related to mobile phones is quite robust and could thus be applied by other companies (with research departments or outsourced research agencies) and researchers. Papers with more details about this robust methodological approach were presented at the conference in Slovenia, the specific of which is that it tries to bring together different stakeholders (references of the papers are available in "Additional information" section. **IMPACT** First, by advancing and reinforcing the knowledge base on the acceptability and uses of mobile services by older people, it has an important impact on the fields of ICT&society research, social informatics, gerontechnology, and sociology of

ageing. Secondly, by pursuing scientific rigor and excellence in establishing a methodology of participatory user-centered design of mobile phone applications, it has an important impact on the methodological advances for design, development, and evaluation of new ICTs.

Since the start of this project we also received expression of interest for cooperation with more Slovenian companies (Telekom, Smart Com, Marand), as well as a Dutch company (GoCiety) who are all developing market-ready e-care and/or e-health solutions and want to co-create their services through intense user involvement. We are currently also involved in several H2020 proposal development for different calls and in all consortia our role is to adapt, further develop and apply our 3-staged model of user involvement.

What are the **basic conditions the region needs to have** to be successful in transferring this good practise?	The basic condition for successful transfer of good practice is **awareness of regions and policymakers on the importance of the addressed issues** (population ageing; digital exclusion of older adults; needs of older adults regarding ICTs; involving older adults in the development; potential of mobile phones as assistive services…) and enough financial resources allocated at projects addressing those issues, enabling intensive user involvement through cooperation of 4 key types of stakeholders (industry, researchers, end users, public authorities).
What are the **basic conditions the leading recipient from the region needs to have** to be successful in transferring this good practice?	To implement the proposed approach for user involvement in the development of smart solutions for active and healthy ageing, it is of vital importance to have enough **time and resources**. This can be an important drawback for market funded project, where usually there is not much time, resources, and the capacity for intensive user involvement foreseen. Nevertheless, the robustness of approach allows using only its certain parts and/or phases, whether only quali- or quantitative approaches, or only one/two phases. It can be applied on various fields, in various projects, and used among designers, developers and/or ICT-based services providers what also makes it transferable.

Key threats in GP project transfer

What are the **key potential threats for the GP project transfer?**	The key potential threats for the project transfer are: • To implement the proposed approach, it is of vital importance to have enough time and resources. This can be an important drawback for market funded project, where usually there are not much time, resources, and the capacity for intensive user involvement foreseen.

	• Researchers and teams implementing proposed approach should have some previous knowledge on older adults as research subject and specifics related to their lifestyle characteristics, sensory and cognitive deficits, and mobility issues and potential illnesses. Furthermore, they also need to have basic knowledge on research methods such as focus groups, semi structured interviews, surveys, usability studies, co-creation sessions… and must be familiar with the stages of the research process (planning, implementing, analysing, interpreting and reporting).
	• Another threat is the absence of the possibility for intensive cooperation among industry players and researchers. Researchers should have enough time and other resources to help the enterprise to come to the end of the last stage of the methodological approach, e.g. the personas developed based on the results of qualitative and quantitative studies applied within the research process.
	• Nevertheless, the threat also lies in the absence of adequate calls for proposals and initiatives promoting this kind of cooperation among industry/enterprises and research subjects. It is important for policy make to have awareness of the facilitating role of such partnerships among industry, researchers and end users, whereby the latter are involved in the whole process of research and development.

4. Description of the GP project

The "Description of the GP project" section provides more detailed information on the Good Practice project (GP project) and enables readers to get further detailed inspiration and easy ready-to-use information for possible innovation transfer to other project applications. This includes: tackled problem, time length of the GP project, objectives, phases, activities and deliverables of the GP project, its main innovation and target group.

Description of the tackled problem

What was the **problem / challenge tackled** by the project?	Contemporary societies are facing two striking trends: widespread population ageing and rapid diffusion of information and communication technologies (ICTs). Since old age often implies ailing health and social isolation, societies could embrace the advances in ICTs to enhance social integration, health and active ageing. However, the complexity and novelty of ICTs threaten many older people with exclusion from their use. Older people could be offered e-services, which would improve their quality of life, if based on age friendly design. Although digital inclusion is strongly advocated in the EU research and policy strategies and associated with positive outcomes such as high quality of life for older

people, and new market opportunities for ICT system providers, the uptake of assistive technologies (ATs) among elderly is slow-moving.

In this context, mobile phones (MPs) represent an opportunity for digital inclusion due to their already widespread use among the elderly. Especially, their poorly exploited integration with ATs could foster active ageing. Security, social inclusion, mobility and accessibility (Conci et al. 2009) are the most important motives for the use of MP among the elderly. In addition, several other motives were identified such as autonomy, independence and companionship, because MPs enable staying in contact and exchanging of social support with family members (Conci et al. 2009; Van Biljon & Renaud 2008), which should have positive effects for their physical and mental health (Pahor et al. 2009). Moreover, another important motive includes an easier management of daily activities as MPs allow a more efficient organization of daily life (e.g., saving numbers, reminders). Such motives are related to the use of functions on MPs. Older people regularly use the basic functions of a MP such as voice calls, time/date, contacts, SOS button, alarm, and calculator (Chen et al. 2013), while they rarely resort to advanced services (i.e., notepad, GPS, email, wi-fi), because they are unknown to them.

The project develops an integrated theory-driven and evidence-based approach in
order to stimulate the uptake of technological solutions for active and healthy ageing for a "triple-win" outcome: 1) improved wellbeing of older adults and their informal carers; 2) financial gains for the health and social care sectors; 3) new market opportunities for providers of mobile services.

What were the **reasons for the problem?**	The need of older adults to live at home for as long as possible, increasing costs of long-term care (leading to unsustainable health and social care systems), and burdened informal carers can nowadays no longer be ignored. These characteristics of an ageing society are pressuring policy makers, industry, researchers, and civil society organizations to develop and mainstream ICT-based assistive services (ASs). Despite the growing body of evidence about ICT-based ASs' positive effects, Slovenia is in its infancy regarding the adoption of smart solutions for active and healthy ageing.

Despite the obvious opportunities that are ensured by the socio-technical affordances of mobile phones (Doughty 2011; Joe & Demiris 2013), the integration of assistive services with mobile phones has been poorly exploited |

(Verstockt et al. 2009). The reasons lay in incredibly fast development and diffusion of technological solutions, which harden the researchers' ability to study the complexity of the ICTs' social implications. Literature review indicates that the lack of appropriate technologically-based services can be explained by the fragmentation of theoretical and empirical knowledge across the related research fields, which prevents the integration of various findings on active ageing and digital inclusion of the older people.

To understand the limitations associated with the appropriation of advanced services on MPs - including ATs - key specific characteristics and constraints of older adults must be considered (Rogers & Fisk 2010). In fact, their specifics importantly condition the (tailored) design and adoption of technology solutions/services for older people. In this context, TAM (Davis 1989) and its variations (e.g., TAM2, TAM3, UTAUT) (Venkatesh & Bala 2008, Venkatesh & Davis 2000; Venkatesh et al. 2003) identified five seminal factors: perceived ease of use, perceived usefulness, attitude, intention to use, and actual use. It has been noted that older adults have lower perceived usefulness and lower perceived ease of use.

Time length of the GP project

What was the **time length** of the GP project in months?	36 months

Objectives of the GP project

Describe the **overall and specific objectives** of the GP project	Overall aims of the project are: • To integrate the existing knowledge in this field and on this basis develop an appropriate theoretical approach that will ensure a fuller conceptual understanding as well as valid empirical research on the relationship between digital inclusion (with the use of ATs in mobile phones) and active ageing, and thus contribute to the development of advanced user-friendly ATs on mobile phones for the older people. • To develop a user-oriented, participative and integrative methodological approach to studying the use and usability of mobile phones among the older people that will be based on a combination of qualitative and quantitative research methods as well as on active inclusion of potential end users. Specific objectives of the project are:

	• To explore how ATs in mobile phones and other mobile applications could positively contribute to the quality of life of different groups of older people.
	• To develop a methodological framework and concrete methods and tools to involve older users in all phases of the (co)design process with respect to their functional and non-functional needs.
	• To draw up a roadmap guiding future research and development of suggested mobile application(s).
	• To ensure all relevant needs relating to the specific characteristics of key user groups are met to the fullest feasible extent.
	• To capture and systematise needs relating to different stakeholders (older people, family members, mobile service providers).
	• To measure the impact of factors that influence the acceptability of (ATs in) smartphones, as well as the facilitating and constraining factors of fostering quality of life with the usage of specific mobile applications.
	• To generate first design ideas of mobile applications for older people.
	• To conduct a detailed analysis regarding already available (ATs in) mobile applications that foster active ageing.
	• To review and identify approaches and concepts for HCI concepts for the older people.
	• To ensure users contribute fully to the design of the mobile applications.
	• To invoke and involve potential researchers for further collaboration on our research activities.
	• To inform the business environment, industry and the general public about the project's results in Slovenia, the EU and globally.
	• Organization of dedicated events and specific workshops to promote the uptake of mobile assistive services among the older adults.

Phases, activities and deliverables

List all **main phases** of the GP project including their time length	**WP1: PROJECT MANAGEMENT** • WP1.1: Project administration; *Duration: M1-M36 (36 months)* • WP1.2: Coordination of research activities; *Duration: M1-M36 (36 months)* • WP1.3: Preparatory research activities; *Duration: M1-M3 (3 months)* **WP2: ECO-GERONTECHNOLOGICAL CONCEPTUAL MODEL** • WP2.1: Literature review; *Duration: M1-M3 (3 months)* • WP2.2: Development of the eco-gerontechnological model; *Duration: M4-M5 (2 months)* **WP3: USER-CENTERED METHODOLOGICAL APPROACH**

- WP3.1: Literature review; *Duration: M1-M3 (3 months)*
- WP3.2: Development of the user-centered methodological approach; *Duration: M4-M5 (2 months)*
- WP3.3: Roadmap for research beyond project duration; *Duration: M34-M36 (3 months)*

WP4: NEEDS ASSESSMENT ANALYSIS AND GENERATING DESIGN IDEAS

- WP4.1: Needs assessment analysis*; Duration: M5-M11 (7 months)*
- WP4.2: Generating design ideas; *Duration: M12-M16 (4 months)*

WP5: APPLICATIONS SELECTION AND GENERATING & EVALUATING REDESIGN IDEAS

- WP5.1: Mobile applications overview and selection; *Duration: M5-M8, M17 (5 months)*
- WP5.2: Evaluation of selected mobile applications; *Duration: M5-M8, M18-M24 (11 months)*
- WP5.3: Paper prototype development; *Duration: M25-M29 (4 months)*
- WP5.4: Evaluation of paper prototype, generating redesign ideas and paper prototype refinement; *Duration: M30-M36 (6 months)*

WP6: DISSEMINATION OF THE RESULTS

- WP6.1: Dissemination within scientific community; *Duration: M4-M36 (33 months)*
- WP6.2: Dissemination in the business environment, industry, and to general public; *Duration: M4-M36 (33 months)*
- DP6.3: Workshop and events for the promotion of use of assistive services on mobile phones among older adults; *Duration: M12, M24, M33-M36 (5 months)*

List and describe all **main activities** that were implemented by the GP project	**WP1: PROJECT MANAGEMENT** WP1.1: Project administration - Organization and management of administrative meetings of the project group. - Establishment of effective communication with other research organizations and all interested parties to present the project activities and disseminate project results. - Preparation of periodic reports in line with the Rules on the Procedures of the co-funding and Monitoring of Research Activities Implementation and the project contract. - Overall monitoring of project work performance and compliance of project activities with the proposal and contractual obligations. - Establishment of the IPR Agreement.

WP1.2: Coordination of research activities

- Establishment of internal online communication platform for the project group.

- Planning, scheduling and coordinating research activities within the project group.

- Organization and management of regular research meetings of the project group.

- Providing the project group members with internal briefings on current project findings relevant for their work assignments.

WP1.3: Preparatory research activities

- Establishment of the initial research design and quality control plan.

- Harmonization of roles and tasks of project members at the theoretical and empirical research level.

- Archiving of relevant prior literature and research.

- Establishing the project Expert Advisory Board.

- Elaboration of a copyright agreement on the project results.

WP2: ECO-GERONTECHNOLOGICAL CONCEPTUAL MODEL

WP2.1: Literature review

- Systematic review of relevant literature within uses & gratifications theory.

- Systematic review of relevant literature within the framework of technology acceptance model (TAM).

- Systematic review of relevant literature within environmental gerontology, theory of person-environment exchange processes and quality of life studies.

- Systematic literature review on functional and non-functional difficulties of older people and gerontechnology

WP2.2: Development of the eco-gerontechnological model

- Adaptation of the ecological model.

- Adaptation of the understanding of person-environment processes of daily behaviour.

- Adaptation of technology acceptance models

- Integration of main components and factors of eco-gerontechnological model.

WP3: USER-CENTERED METHODOLOGICAL APPROACH

WP3.1: Literature review

- Systematic literature review on Experience and Application Research (E&AR).
- Systematic literature review on user-centered design, participatory design, contextual design and on ISO Human-centred design for interactive systems (ISO 9241).
- Systematic literature review on the suitability and adaptation of qualitative and quantitative methods to different groups of older people.

WP3.2: Development of the user-centered methodological approach

- Adaptation of E&AR and other user-centred approaches for elderly needs collection and analysis.
- Development of the user-centred methodological approach guidelines and conclusions: methodological framework and tools for involvement of older people in the (re)design of and evaluation mobile applications in laboratory and field testing.
- Development of detailed guidelines on combining qualitative and quantitative methods when studying needs analysis and usability of mobile applications among older people.

WP3.3: Roadmap for research beyond project duration

- Development of the plan for drawing up detailed scenarios, use cases and storyboards for mobile applications.
- Drafting a template for the mobile applications' manual with instructions of use.
- Development of the study of prototype's implementation among the potential end-users beyond project duration.

WP4: NEEDS ASSESSMENT ANALYSIS AND GENERATING DESIGN IDEAS

WP4.1: Needs assessment analysis

- Definition and operationalization of measured concepts.
- Development of a questionnaire.
- Implementation and pilot testing of telephone survey.
- Sampling and data collection.
- Data analysis.

WP4.2: Generating design ideas

- Preparation and testing of semi-structured interview questions.
- Identification, selection (with purposive sampling) and recruitment of

participants (older people and family members).

- Conducting interviews and focus groups.
- Analysing the collected data (using qualitative text analysis procedures).
- Development of personas.

WP5: APPLICATIONS SELECTION AND GENERATING & EVALUATING REDESIGN IDEAS

WP5.1: Mobile applications overview and selection

- Detailed (market) analysis of the latest technological advances regarding (ATs in) mobile applications.
- Secondary analysis of latest data and trends related to the use of mobile phones, mobile phone applications and ATs among older people.
- Meeting will be arranged with the experts and decision-makers from the cofunding organisation at which selected applications will be presented and feedback sought.

WP5.2: Evaluation of selected mobile applications

- Literature review of HCI approaches and guidelines for older people.
- Development of instruments and protocols for usability inspection.
- Development of the test protocol designs to be used in laboratory testing and field testing.
- Development of templates and instructions for the diary study.
- Development of a standardised questionnaire (SUMI or SUS) to be filled out by participants involved in pilot use.
- Conducting cognitive walkthrough (by the members of the research team).
- Identification, selection (with purposive sampling) and recruitment of participants for laboratory testing, field testing and pilot use.
- Conducting 10 usability tests of selected mobile applications in laboratory testing.
- Conducting 10 usability tests of selected mobile applications in field testing.
- Conducting a 2-month diary study with selected mobile applications in pilot use and questionnaire completion (n=16).
- Analysing the collected data from laboratory testing, field testing and pilot use.
- Organising virtual meeting with the members of the advisory board.

WP5.3: Paper prototype development

- Development of user stories for mobile application(s).

- Validation of the user stories by the research team from cofunding organisation.
- Development of 1-3 scenarios and corresponding use-cases for mobile application(s).
- Conducting expert walkthrough (by the members of the research team).
- Development of refined scenarios and 1-3 paper prototype(s).

WP5.4: Evaluation of paper prototype, generating redesign ideas and paper prototype refinement

- Development of a detailed plan and protocol for organising and carrying out prototype tests involving potential end-users.
- Conducting 2 paper prototyping group sessions with older people (with 4-5 participants).
- Conducting 2 paper prototyping group sessions with family members (with 4-5 participants).
- Conducting 2 paper prototyping group sessions with specific domain's experts (with 4-5 participants).
- Conducting 6 paper prototyping individual sessions with older people.
- Development of final paper prototype(s); specific methodological guidelines and good practices will be included in the roadmap.

WP6: DISSEMINATION OF THE RESULTS

WP6.1: Dissemination within scientific community

- Formal presentation of the activities and results of the project within the research community.
- Informal presentation and discussion of the findings with research groups and other potential stakeholders with broad interest in mobile applications for the elderly.
- Periodic publication of project results on list servers and online discussion groups related to mobile communication research, gerontology and human-computer interaction research.
- Approximately 5-8 annual presentation of results and project activities at international scientific conferences.
- Approximately 8 publications in scientific journals indexed by Scopus, SCI, SSCI.

WP6.2: Dissemination in the business environment, industry, and to general public

	• Preparation and distribution of an online newsletter every three months.
	• Establishing and maintaining a publicly accessible project website.
	• Publication of project results and other related information on the existing websites, which are thematically related to the project actions and objectives.
	DP6.3: Workshop and events for the promotion of use of assistive services on mobile phones among older adults
	• Organization of an annual national event (infoday) on the trends and state-of-art knowledge about the development of ATs and support services on mobile phones.
	• In collaboration with national organizations for intergenerational cooperation in field of ICT skills for older people, organization and promotion of at least three workshops per year aimed at promoting the use of support services on mobile phones.
	• Organization of workshops for sales and after-sales support stuff in order to improve their knowledge and skills in providing advice and assistance to elderly users in improving their mobile phone usage skills.
List all **main deliverables** of the GP project	WP1: PROJECT MANAGEMENT • Administrative project reports • Website for internal communication of the project group and archiving project materials • Detailed research plan • Online database of references and existing research • Project's Advisory Board membership • Copyright agreement on the project results WP2: ECO-GERONTECHNOLOGICAL CONCEPTUAL MODEL • Theoretical literature review • Eco-gerontechnological model WP3: USER-CENTERED METHODOLOGICAL APPROACH • Methodological literature review • User-centered methodological approach • Roadmap for research and development of mobile applications beyond project duration WP4: NEEDS ASSESSMENT ANALYSIS AND GENERATING DESIGN IDEAS Report on acceptance of mobile phones and mobile applications and ageing well

	Report on generating design ideas for active ageing
	WP5: APPLICATIONS SELECTION AND GENERATING & EVALUATING REDESIGN IDEAS • Report on technological state-of-the-art and uptake of smartphones among older people • Report on evaluation of selected mobile applications based on laboratory testing, field testing and pilot use • Scenario(s) of mobile application(s) that foster active ageing • Paper prototype(s) of mobile application(s) that foster active ageing

Main innovation of the GP project

What was the **main innovation** of the GP project?	The project introduces an innovative methical approach that comprehensively explains the relationship between the socio-psychological needs of older people and their technology design preferences. The project is innovative on the conceptual and methodological level: based on the integration of technology acceptance models and theory of person-environment exchange processes an eco-gerontechnological model will be developed which enables a holistic conceptual link between ageing well and acceptance of mobile applications among older people. Moreover, based on adaptation of the Experience and Application Research and human-centred design process - ISO 9241 a user-focused, participative, iterative, context-aware, mixed-methods and age-friendly methodological approach for studying the needs, use, usability and benefits related to mobile phones will be developed. Such participatory approach will facilitate a move from technology-driven to user-centred design in research and development of applications for mobile phones and ICT-based assistive services. Needs and perceptions have been studied in three stages: 1) eliciting users' needs and generating general design ideas; 2) evaluations selected existing mobile application in lab settings and real environments and generating redesign ideas; and 3) evaluating redesign ideas together with older adults. This newly developed integrative approach presents one of the first comprehensive, socio-technical analysis of the issue of digital inclusion, active aging, and mobile services as a result of collaboration of a team of skilled home researchers and world-class foreign experts. Moreover, by demonstrating the

| | importance of optimized human-centred design process with a sophisticated methodology that secures a more inclusive involvement of older people in developing ideas with a high potential for technological innovation, we expect high impact on the scientific field that deals with such issues. |

Target group of the project

Who was the main **target group** of the GP project? (SME, LME, research organization, university, public institution, healthcare provider, business supporting organization, other (specify)	The main target group (end-users) of the project are older adults and informal carers. However, the 3-staged model of user involvement is developed to be used by companies (Simobil and others) and researchers, so two types of stakeholders working together and through the co-creation process involving the third type of stakeholder, i.e. older people and their informal carers.
Describe the main target group	The aging population represents one of the most prominent contemporary social trends that affects almost all countries of the world. Consequences of demographic changes are raising questions about financial sustainability of countries to ensure and provide effective and in the long-run cheaper health and social services. Accordingly, recently different (social) science disciplines have focused their interest on exploring the ways in how ICT-based products and services could mitigate the challenges of aging societies.

In terms of technology use, the so called "independent living" or "assisted living" domain has evolved, which today comprises a heterogeneous field of applications ranging from simple devices such as intelligent medication dispensers and fall sensors to complex systems such as ubiquitous computing and ambient intelligence. Although this aspect of digital inclusion has been strongly advocated in the EU strategies, the real impact on the market of end-users has rarely been achieved (Meyer et al. 2011; Kubitschke et al. 2010). Despite their promise of increased safety and comfort, service providers find it difficult to persuade end-users to accept assistive technologies (ATs), which enclose ICT-based systems that assist, enable and empower older people (and also informal and professional carers), address their needs and support them in living independently.

The key obstacles to development and uptake of ATs are related (Dolničar & Nagode 2010; Nagode & Dolničar 2010): (1) to the limited financial resources of |

	end-users; (2) to a scarce recognition of ATs among the general public and target population; (3) to poor usability of ATs and related services. Despite attempts by researchers and the industry to make ATs as user friendly as possible, often solutions are scarcely tailored to the needs and skills of elderly (Gaßner 2010; Melenhorst et al. 2006), who are typically characterized by ICT-related fear and lack of confidence as well as unwillingness to learn and perfect ICT-related skills (Richardson 2006). In this context, mobile phones seem to represent an increasing opportunity for digital inclusion due to their already widespread use among the older people (Chen et al. 2013; Petrovčič et al. 2012) and due to possibility of continuous availability from anywhere at any time (Wang et. al. 2014).

5. Impact

The "Impact" section provides more detailed information on the effect of the GP project implementation and dissemination of major outputs.

Impact

What was the level of **geographical impact** of the GP project? (village, city, county, country, international, other (specify)	Country (Slovenia)
What were the final **impact indicators including their quantification**?	The main impact of this GP is on three types of stakeholders, i.e. compianies, researchers and end-users (older people, informal carers). This GP unfortunatelly had no direct impact on the Ministry or MA. However, they did find this type of cooperation between the 3 stakeholders as important in this field, since they co-financed it. In addition to this, the Research Agency financed another project with similar aims 2 years later (this time financed with Smart Com, a successul Slovenian company). A 3-staged model of user involvement will be also used within one of the projects financed by the Smart specialisation funds. So governmental public authorities are more indirectly (by ways of co-financing) supporting this type of user involvement. **(1) Impact for business partner:** One direct impact for co-funding organization was provided on the basis of results of segmentation of older (potential) users of

mobile services, which industry erroneously treats as a homogenous group. Accordingly, it was able to response to their needs by providing them with tailored mobile phone services. Additionally, methodological approach could be directly used by the business partner in an efficient development of mobile phone innovations for older people.

(2) Impact for companies and economy: The methodological approach for efficient development of consumer technologies with expected high success rate on the market can be applied by any company that is interested in such services. Project's outputs offer many ideas for startups in the mobile application market. Slovenian companies such as Outfit7 and Celtra, which are currently global market players for entertainment mobile apps, could therefore extend their services portfolio. The project also paved the road for further applied research in this field with the existing or other business partners.

(3) Impact for older people: The proposed research activities are foreseen to contribute to an improved personal life of older people in terms of an increased personal independence, enhanced and prolonged digital inclusion and active participation in society for the ageing population through the effective use of useful, affordable and usable support services on mobile phones. By addressing needs of older people in key service areas of high impact such as activities of daily living, safety and participation in their local neighbourhood, a path is opened for active ageing, delivering positive impacts on older peoples' wellbeing and quality of life.

(4) Impact for state/society: The project's activities can be understood as an applicative response to troubles of contemporary societies that are challenged with ageing population. The mobile phone applications can have a direct impact in terms of lowering the burden of social networks of older people, the burden of informal carers, as well as in terms of financial effect on the health and social security system by complementing their functions.

Describe the **changes resulted from the project** activities	The project is strongly embedded in the current and future Slovenian and European information society policy contexts. Specifically, the project addresses one of the priority topics of the Directorate for Information Society (Ministry of Higher Education, Science and Technology) that refers to stimulation of activities for digital inclusion, particularly among older people. The priorities of the Directorate follow the EU policy agenda for ICTs and ageing.

	The project also introduced new methodological approaches to improve the ways how the design, development, implementation and evaluation of software applications can be presented and transferred to industry, policy makers and the public. Hence, the analysis and discussion of potentials of mobile technologies for enhancement of quality of life of older people are expected to exert significant impact on public opinion.
	Public opinion will also be influenced by demonstrating that older people can take any opportunities that are offered by new ICTs. Common sense usually resorts to stereotypes of older people as aversive to (new) ICTs, but disseminating the positive experiences of older people with new mobile applications can help transcend the existing technophobic discourses and can lead to higher acceptance of new technologies by older people. This indirectly also leads to an enlargement of the potential market for companies that (want to) develop mobile and computer applications for older people.
	The project also promoted inter- and transdisciplinarity by bringing together an international group of researchers and business partners from different fields and with distinguished experience with collaboration on successful IT projects, and reinforced the global position of the research group.
	The project contributed also to the actualization of undergraduate and graduate programs at the Faculty of Social Sciences and other study programs in Slovenia. The questions of social aspects of new technologies, especially in the context of older people are underrepresented in the curriculums of universities in Slovenia, while our project improved the situation by providing deliverables that can be built upon both in social science and in computer science study programs.

Dissemination of outputs

Describe **dissemination activities** of the project outputs carried out during the GP project	**Dissemination within scientific community** • Formal presentation of the activities and results of the project within the research community. • Informal presentation and discussion of the findings with research groups and other potential stakeholders with broad interest in mobile applications for the elderly. • Periodic publication of project results on list servers and online discussion groups related to mobile communication research, gerontology and human-

	computer interaction research.
	• Approximately 5-8 annual presentation of results and project activities at international scientific conferences.
	• Approximately 8 publications in scientific journals indexed by Scopus, SCI, SSCI.
	Dissemination in the business environment, industry, and to general public
	• Preparation and distribution of an online newsletter every three months.
	• Establishing and maintaining a publicly accessible project website.
	• Publication of project results and other related information on the existing websites, which are thematically related to the project actions and objectives.
	Workshop and events for the promotion of use of assistive services on mobile phones among older adults
	• Organization of an annual national event (infoday) on the trends and state-of-art knowledge about the development of ATs and support services on mobile phones.
	• In collaboration with national organizations for intergenerational cooperation in field of ICT skills for older people, organization and promotion of at least three workshops per year aimed at promoting the use of support services on mobile phones.
	• Organization of workshops for sales and after-sales support stuff in order to improve their knowledge and skills in providing advice and assistance to elderly users in improving their mobile phone usage skills.

6. Risks

The "Risks" section provides more detailed review of potential risks of this GP project implementation including their defined mitigation strategies to eliminate them.

Describe **risks involved** in implementing this GP project including their **mitigation strategies**	• LACK OF TIME AND RESOURCES: To implement the proposed approach, it is of vital importance to have enough time and resources. This can be an important drawback for market funded project, where usually there are not much time, resources, and the capacity for intensive user involvement foreseen.
	• LACK OF SUPPORT FOR PROPER END-USER INVOLVEMENT FROM THE INDUSTRY PARTNERS: Another risk is lack of interest for intensive cooperation among industry players and researchers. Researchers should

	have enough support, trust, time and other resources to help the enterprise to come to the end of the last stage of the methodological approach, e.g. the personas developed based on the results of qualitative and quantitative studies applied within the research process. • LACK OF INTEREST FOR INVOLVEMENT AMONG THE END-USERS THEMSELVES: When involving a large number of end-users in an iterative user-centered research design, we risk that end-users would not be motivated enough to be involved in the whole process of research and development. INABILITY TO (FULLY) TRANSFER RESEARCH RESULTS IN THE COMMERCIALISATION PROCESS: It is sometimes the case that research results are not taken into account/fully studied & accepted by the sales and/or marketing departments.

7. Budget

The "Budget" section provides more detailed review of costs regarding the project implementation as well as operational sustainability after its end. In addition, if relevant, public tenders within the project and additional generated incomes by the project are showed and explained.

Budget

What was the **overall budget** of the project **in EUR**?	200.000 €
List relevant **budget lines of the project including their % share** from total budget	Budget given by the Slovenian Research Agency: 150.000 € Budget given by Si.mobil (now A1): 50.000 €

Additional income generated by the project

Did the project create any **additional income**?	no, the GP project did not generate additional income
If yes, specify **which type of income and what amount in EUR?**	

Public tender

Did the project include any **public tender**?	yes, the project included a public tender
If yes, specify **what kind of contract** (specific contract, general contract, other)	General contract with the Slovenian Research Agency and general contract with a co-financing private company
If yes, specify in **what amount** in EUR	200.000 €
Describe the **public tender subject**	The subject of the Public call for the (co-)financing of research projects is the (co-)financing of research projects: • small basic research projects and small applied research projects • post-doctoral basic and post-doctoral applied research projects The Agency financed 75% of eligible project costs for this applied project. The applicant of an applied project (University of Ljubljana) had to ensure that at least 25% of eligible project costs are covered by a private company (Si.mobil; now A1). We needed to submit proof of the project's co-financing (a co-financing agreement) for the entire period of the project's implementation in view of the value of a research hour at the start of financing. Co-financing was only possible in the form of money.

Financial sustainability after GP project end

Was there an **operational financial sustainability plan** in the project **after its end**?	no, the GP project did not include an operational financial sustainability plan
If yes, specify **where the operational funds** after project end **came from?**	
If yes, specify the **amount of operational funds** in EUR	

8. Other information

In this section, specific additional information about the GP project could be revealed.

Please describe **any other relevant information about this GP project** (if relevant)	More information about the 3-staged model for user involvement can be found in 2 papers: DOLNIČAR, Vesna, ŠETINC, Mojca, PETROVČIČ, Andraž, et al. Tristopenjski model vključevanja uporabnikov v razvoj pametnih storitev za aktivno in zdravo staranje. In: GAMS, Matjaž (ed.), BAJEC, Marko (ed.). *Delavnica Elektronsko in mobilno zdravje : zbornik 19. mednarodne multikonference Informacijska družba - IS 2016, 10.-11. oktober 2016, [Ljubljana, Slovenija] : zvezek G = Workshop Electronic and Mobile Health : proceedings of the 19th International Multiconference Information Society - IS 2016, 10-11 October 2016, Ljubljana, Slovenia : volume G.* Ljubljana: Institut Jožef Stefan, 2016, pp. 32-35. http://library.ijs.si/Stacks/Proceedings/InformationSociety/2016/IS2016_Volume_G%20-%20EMZ.pdf. [COBISS.SI-ID 34384733] DOLNIČAR, Vesna, ŠETINC, Mojca, PETROVČIČ, Andraž. M-zdravje in podporne tehnologije na pametnih telefonih v družbi staranja: razvojne priložnosti in izzivi za prihodnost. In: GAMS, Matjaž (ed.), PIRTOŠEK, Zvezdan (ed.), TROBEC, Roman (ed.). *SPS delavnica EM-zdravje : zbornik 18. mednarodne multikonference Informacijska družba - IS 2015, 9. in 12. oktober 2015, [Ljubljana, Slovenia] : zvezek G = SPS EM-health workshop : proceedings of the 18th International Multiconference Information Society - IS 2015, October 9th and 12h, 2015, Ljubljana, Slovenia : volume G*, 18. Mednarodna multikonferenca Informacijska družba - IS 2015, Ljubljana, 6. oktober 2015. Ljubljana: Institut Jožef Stefan, 2015, pp. 30-35, ilustr. http://library.ijs.si/Stacks/Proceedings/InformationSociety/2015/IS2015_Volume_G%20-%20Delavnica%20EMZ.pdf. [

9. Information gathered by …

The information about this good practise (GP) project has been gathered for the purpose of the HoCare project (Interreg Europe Programme) by the following organization:

Region	Slovenia
Organization name(s) (+ in local language in brackets)	University of Ljubljana, Faculty of Social Sciences, Centre for Social Informatics (Univerza v Ljubljani, Fakulteta za družbene vede, Center za družboslovno informatiko)
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