

MobileAge

Study on Co-Creation Practices

Co-creating digital public services for an ageing Europe

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List of abbreviations

ACM	Association for Computing Machinery
AFEE	Age-friendly Environments in Europe
API	Application Programming Interface
BORIS	BürgerOnlineRedaktion im Stadtteil
CORDIS	Community Research and Development Information Service
CSCW	Computer Supported Cooperative Work
DIS	Designing Interactive Systems
EC	European Commission
ELSA	The English Longitudinal Study of Ageing
ELSI	Ethical, legal and social implications
EU	European Union
FTB	Forschungsinstitut Technologie und Behinderung
GNAFCC	Global Network for Age-friendly Cities and Communities
GPS	Global Positioning System
H2020	Horizon2020
HCI	Human-Computer Interaction
ICT	Information and Communication Technologies
IFIB	Institute for Information Management Bremen GmbH
ISD	Information System Development
ISO	International Organization for Standardization
IT	Information Technology
LOSD	Linked Open Statistical Data
NAP	National Action Plans
NGO	Non-governmental Organisations
OECD	Organisation for Economic Co-operation and Development
OGD	Open Government Data
OGI	Open Government Intelligence
OGP	Open Government Partnership
PD	Participatory Design
PDC	Participatory Design Conference
PSD	Participatory System Design
RCM	Region Central Macedonia
SAP	Systems, Applications and Products

SL	South Lakeland
SME	Small and Medium Enterprise
SPOD	Social Platform for Open Data
STS	Science and technology studies
WHO	World health Organization
ZGZ	Zaragoza

Executive summary

This document is part of the final output of the Mobile Age project, a three-year, EU-funded research and innovation action which has co-created digital public services with substantial participation of older citizens. The overall aim of Mobile Age was to

Co-create open digital services for age-friendly cities and communities

The study's focus is on our own co-creation activities. It describes and compares the five Mobile Age co-creation processes in which we co-created digital public services with and for older adults. We identify and analyse some of the key challenges and also derive to a more general assessment of what co-creation may achieve, where the most promising areas of application may be expected and where it probably does not match with the contingent requirements of services. Overall, we argue that co-creation is becoming a cornerstone of public sector innovation, which is used in two different contexts: eGovernment and Open Government. Both have their own promises which co-creation is meant to support:

1. The promise of **eGovernment** is to deliver electronic public services to citizens and businesses, which reduce administrative burden and are user-centred.
2. The promise of **Open Government** is to transform the relationship between governments and citizens into a transparent, participatory and collaborative partnership.

In this study, we trace the origins of co-creation back to three distinct domains, in which co-creation has become an equally important approach with different understandings of what it is and entails: (1) the **co-production of public services**, (2) the **co-design of information systems** and (3) **civic use of open data** (civic tech/civic hacking). Different co-creation processes make use of (and adapt) some of the engagement methods employed and experimented with in each of those streams (e.g. co-design methods). Each of these choices has **implications for the roles citizens and governments** may assume in co-creation processes, its focus and results. We therefore not only analyse the co-creation processes on the level of its governance structure, but also **pay attention to how particular methods scope co-creation**.

Summary

- Co-creation may become a way to improve the quality of eGovernment services and thus their uptake, by involving end users as partners in the planning, design and provision of digital services.
- However, co-creation is a complex and demanding process for both sides: government units as well as citizens, and requires careful planning and evaluation.
- Co-creation consists of several phases, from the early identification of problems and needs, the conceptualisation of a service and its design to its implementation and maintenance.
- The biggest challenge is to engage a knowledgeable and motivated group of citizens whose contributions lead to improvements of a service that benefits an entire target group.
- Co-creation requires more resources than ordinary service design; it only pays off when government units meet the proposals of citizens with sufficient scope for action. This is more likely for local or regional information services than for nationwide transaction services.

Introduction

Relation of this document to other Mobile Age deliverables and work

This document is part of the final output of the Mobile Age project, a three year, EU-funded research and innovation action which has co-created digital public services with substantial participation of older citizens. The overall aim of Mobile Age was to

Co-create open digital services for age-friendly cities and communities

This included objectives such as

- enabling civic open data use of older adults,
- increasing digital inclusion of older adults, and
- co-creating sustainable digital public services for older adults

So far, older adults are using the internet and in particular eGovernment services to a much lesser degree than other age groups (digital divide as age divide). One important reason is that many do not expect any benefits for their daily life. Mobile Age supposes that this assumption is largely true and that a way to make digital services more attractive and beneficial for older adults is to involve older adults in the process of identifying, conceptualising and designing relevant and usable digital services for them. As such, Mobile Age follows and extends an approach to co-creation that exceeds traditional ways of citizen participation. It explores, develops and tests new methods and tools, i.e. social and technological innovations. Part of the socio-technical innovation that Mobile Age strives to develop is a **reflective methodology for co-creating with older adults**. This study contributes to this goal.

The study is based on co-creation activities in four different cities/regions in Europe: Bremen, South Lakeland, Zaragoza and Thessaloniki. In Bremen, Zaragoza and Thessaloniki, we worked on the level of city districts, in South Lakeland it was the county district level. In a first phase, Bremen (district Osterholz) and South Lakeland conducted their co-creation processes from May 2016 to February 2017 (marked in green box in figure 1). The learnings from these two processes fed into the planning and implementation of co-creation processes across all four field sites. The learnings were recorded in three deliverables (D1.1 Interim study on accessibility, digital mobility & open data; D1.2 Interim study on co-creation practices and D1.3 Interim Guidebook – all marked in blue boxes in the figure 1).

While Bremen initiated a new process in a second district (Hemelingen) to experiment with different forms of engaging stakeholders, project governance and methods, South Lakeland continued their process. This study is hence based on five co-creation processes in four different field sites (marked in green boxes in the figure 1).

All of these co-creation activities were documented in Senior Citizen Engagement Reports (D3.2 – D3.5) in which each of the field sites reported on their co-creation interventions, evaluated their processes and outcomes, and presented lessons learned. In a subsequent report, we evaluated the accessibility and usability of the outputs (apps) of each of the co-creation activities (D3.6). These reports build the basis for this study. In addition, the study built on insights from the Final study on accessibility, digital mobility & open data (D1.4) as well as the Interim Exploitation Plan (D5.3) with respect to considerations about sustainability.

This study will feed into the Final Guidebook (D1.8).

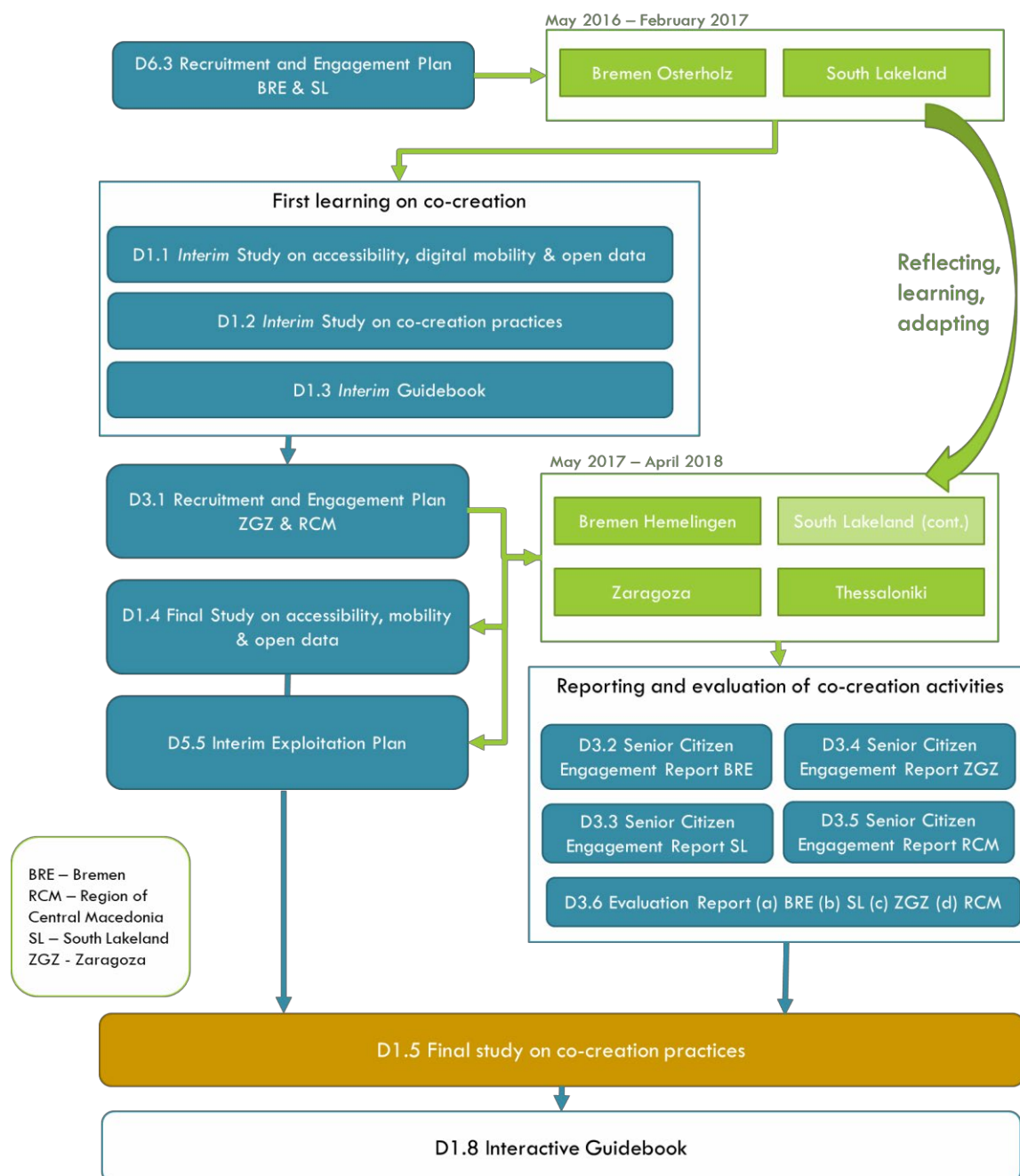


Figure 1: The two phases of co-creation activities in Mobile Age (green boxes) and corresponding deliverables (blue boxes). Information flow is presented through arrows. This deliverable is marked in ochre, the upcoming Interactive Guidebook in white. A legend is provided on abbreviations on the left hand side (white box with green surrounding).

Structure of this document

The **first section** of the study provides an **introduction** to the context in which co-creation of digital public services take place and their origins as well as a review on the roles of (older) citizens in co-creation process (chapter 1). Subsequently we introduce our research methodology (chapter 2) and the context of our own co-creation processes (chapter 3). In this section, we are interested in answering the following questions:

- How and why has the concept of co-creation emerged and developed?
- To what broader developments and trends does it relate, in particular with respect to the trend towards opening and digitising governments?

In the **second section**, we provide an **analysis of the co-creation processes**, their outputs and outcomes. This section addresses the following questions:

- What may be the role of older citizens in co-creation processes and how do different methods may facilitate role-shifts?
- What may be the role of intermediaries, service providers and government in co-creation?
- What may be the (potential) contribution of co-creation with older adults to age-friendly cities and communities?

The **final section concludes this study** and attends to the following questions:

- What are challenges of framing citizens as users in co-creation projects?
- Can co-creation improve benefits for users of public services equally for all kinds of services and all citizens?
- What are the tensions and possibilities arising from the co-creation of digital public services? Are there any conflicts between partial objectives such as openness versus sustainability?
- What are the challenges and opportunities of civic engagement with open data?

This study describes and compares the five Mobile Age co-creation processes, in order to identify and analyse some of the key challenges. From these case studies, we also derive a more general assessment of what co-creation may achieve, where the most promising areas of application may be expected and where it probably does not match with the contingent requirements of services.

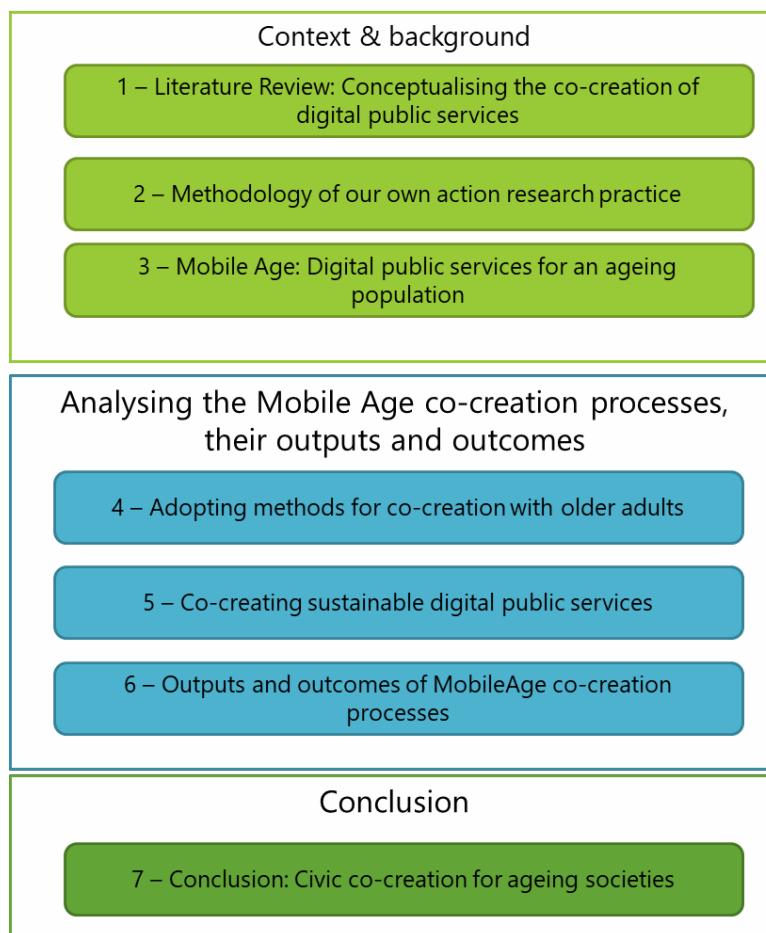


Figure 2: Overview document structure

1 Literature review: Conceptualising the co-creation of digital public services

1.1 Introduction

In the past ten years, co-creation has become a buzzword for the development and design of products and services across a range of domains: in the private and public sector but also in the areas of art and research. In the public sector co-creation came to be considered “a cornerstone for social innovation” (Voorberg, Bekkers, & Tummers, 2015 p. 1346). By bringing together government agencies, NGOs, citizens and/or businesses co-creation promises the collaborative development of public services or services of public interest. The hope is that through the involvement of civil society actors in the development and delivery of public services, these processes will become more effective and efficient and the services will better fit the needs of its prospective users.

However, there is no one definition of what co-creation is and how it ought to be done; the origins of the term and areas of application are manifold and so are the objectives of projects stating to conduct co-creation. In general, co-creation can be perceived as a new mode of engaging civil society actors in the planning, design and delivery of digital public services. Within the public sector, co-creation is promoted by organisations such as the European Commission (EC) and the Open Government Partnership. By now most European Member States have joined the Open Government Partnership (OGP) and committed themselves to develop National Action Plans (NAPs) for implementing more transparent, participatory and collaborative governments. Recently a “toolkit” was published by the Open Government Partnership for co-creating such NAPs.

However, co-creation in these contexts does not necessarily mean the same. There are different promises co-creation is expected to help deliver:

3. The promise of eGovernment to deliver electronic public services to citizens and businesses, which reduce administrative burden and are user-centred.
4. The promise of Open Government to transform the relationship between governments and citizens into a transparent, participatory and collaborative partnership.

So far there is little evidence, that co-creation can really help to fulfil these promises. There are some studies which emphasise the potential of co-creation, but almost no evaluation of achievements and no differentiation with regard to suitability of services, kinds of co-creators and their contributions. However, differentiation is necessary for understanding what can and cannot be accomplished through co-creation processes.

As such, the term co-creation is being used across a variety of domains such as business, arts or education. This study focusses on the co-creation of digital public services. In this chapter, we initially define what digital public services are (section 1.2) and then present two—partly overlapping—domains in which digital public services play a role: eGovernment and Open Government (section 1.3). Involving citizens in the planning, design and provision of public services is not new. Rather, there are at least three different approaches on which such activities are based. In each of these approaches co-creation plays an increasingly important role:

- Co-production of public services
- Co-design of information systems

- Civic open data use (civic hacking)

We will review the main concepts, objectives and methods in these approaches as well as the roles of citizens/users in their participatory processes (section 1.4). We then relate these findings to how other H2020 projects have approached co-creation (section 1.5) and proceed with presenting our own co-creation methodology (section 1.6) and the roles of citizens as co-creators (section 1.7). Finally, we outline some specific considerations for co-creating with older adults (section 1.8).

1.2 Digital public services

In order to identify the kind of services that were suitable for co-creation, services can be distinguished by three criteria:

1. The kind of interaction between service provider and user
2. The kind of service provider
3. The area or domain of the service

We will review these in the following.

Interaction between service provider and user

In the eGovernment context, there is a distinction between **different kinds of interaction** according to the maturity of sophistication. Layne and Lee (2001) introduced the categories of information, communication, transaction and integration. The bi-annual benchmarking of eGovernment services in EU-Member States uses a similar five stages maturity model (Fig. 3).

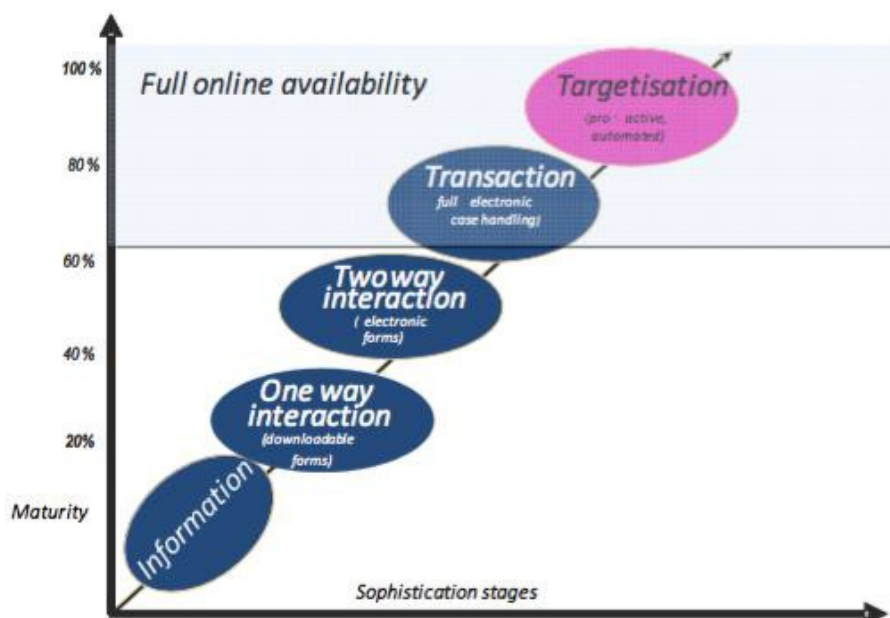


Figure 3: Five-stage maturity model in eGovernment (European Commission, 2009)

Each stage is connected with different technical, organisational and legal requirements and not equally suited for co-creation with civil society organisations or even citizens as end users.

Of course, the highest maturity level is the most sophisticated and so far reached only in very few cases. Fig. 4 shows the difference between horizontal and vertical integration.

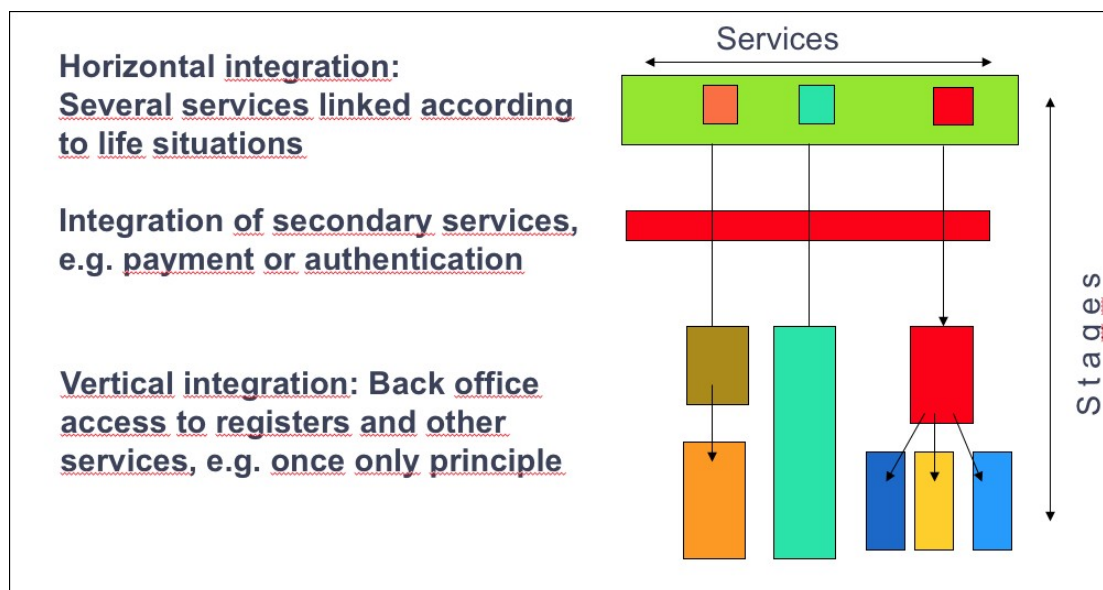


Figure 4: Integration of services in eGovernment

Horizontal integration is achieved, when different services are integrated, that are regularly used together in a certain life situation, e.g. when people are moving from one place to another, they have to provide changes of their address with many offices and businesses. With horizontal integration they have to enter these data only once. **Vertically integrated services** automatically catch data from central registers and relieve users from entering these data at all. Both ways require interoperability between the different services. If they are run by different agencies, there is a need for inter-organisational coordination. It is difficult to imagine that individual citizens can be of any help for advancing such service integration as these are inner-organisational processes. In contrast, **information services seem more suitable for co-creation between service provider and prospective service users.**

Service provider

The second distinction of public services refers to the kind of service provider. In the eGovernment and Open Government context the main focus is on government agencies at national, regional or local level. Many of the services provided by these agencies are regulated by law; their development and design is governed by public procurement regulation, co-determination of employees representatives and accessibility guidelines. However, the term public service also applies to **services of the public interest**, which also may be provided by social welfare organisations or other civil society organisations. Examples for such services are pre-schools, civic meeting centres, consultation services, which may be partly under government licence and with government funding. In most cases, such service providers have more autonomy over the information services they provide and therefore may be more open to co-creation.

Service domain

Finally, the third criteria refers to the area or domain of a service such as social welfare, health, environment etc. These areas are **regulated to different degrees** with respect to which information have to be provided and which information may not be published. For

example in Germany the publication of information on “hygiene control in restaurants” has been forbidden by court.

1.3 Co-creation in eGovernment and Open Government

1.3.1 From administration centric to customer-driven service development

There has been a long debate about why a lot eGovernment (electronic government) services have not experienced the uptake that was anticipated. In fact, many eGovernment services have not been adopted well by citizens. Since 2001, the European Member States held the biannual Ministerial Conferences to review the achievements of eGovernment across Europe and committed to agree upon improvement. These achievements have been documented in bi-annual benchmarking reports (European Commission, 2009), featuring statistics and recommendations concerning 12 eGovernment services for citizens:

- Income taxes: declaration, notification of assessment
- Job search services by labour offices
- Social security contributions (3 out of the following 4):
 - Unemployment benefits
 - Child allowances
 - Medical costs (reimbursement or direct settlement) +
 - Student grants
- Personal documents (passport and driver's licence)
- Car registration (new, used and imported cars)
- Application for building permission
- Declaration to the police (e.g. in case of theft)
- Public libraries (availability of catalogues, search tools)
- Certificates (birth and marriage): request and delivery
- Enrolment in higher education / university
- Announcement of moving (change of address)
- Health related services (interactive advice on the availability of services in different hospitals; appointments for hospitals)

Co-creation in this context may be a way to allow for user-centred design and delivery, hence promises greater uptake. The 2009 benchmarking report contained an interesting Maturity Stage Model of eGovernment, which not only provides a reference for assessing the stage of eGovernment in a Member State but also describes the evolution of policy concerns with regards to the citizens as customers of public services.

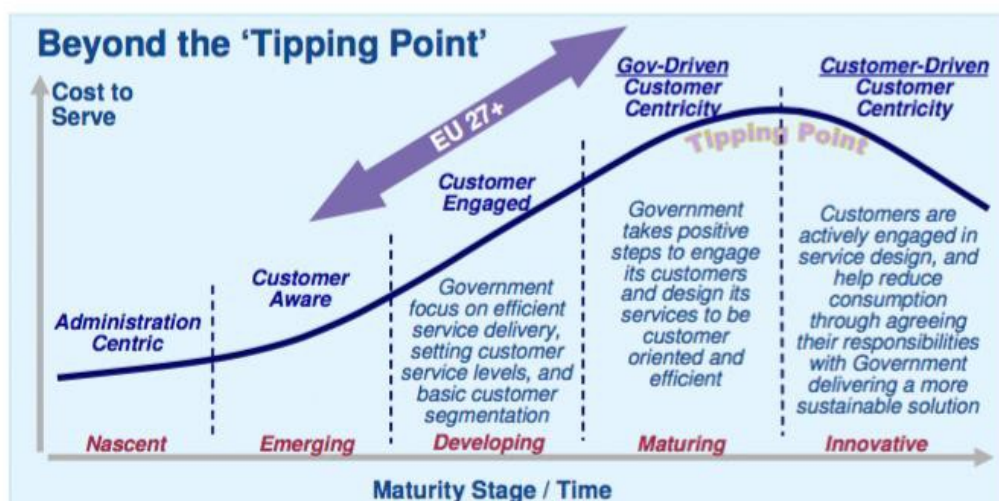


Figure 11: Beyond the 'Tipping Point'

Figure 5: eGovernment Maturity Model. A pathway to customer-driven centricity (European Commission, 2009)

The first declarations in 2001 (Brussels) and 2003 (Como) defined “High Impact eGovernment Services” for citizens and business as a goal and focussed on their availability (**administration centric**), including the inclusiveness and accessibility of these services. In the Manchester declaration (2005), “user-centricity” was first introduced:

A user-centric approach can contribute towards reductions in the administrative burden on businesses (especially SMEs) and citizens, can improve quality of life and can contribute towards trust in government and democracy.

The aim was to develop E-Government services in a way that by 2010 “all citizens, including socially disadvantaged groups, will have become major beneficiaries of eGovernment”. eGovernment was meant to contribute to higher “**user satisfaction with public services**” in general. At the Ministerial Conference in Portugal (2007) it was declared:

It is imperative for governments to ensure citizens and businesses benefit from these investments. Understanding and recognising the importance of citizen-focused services and the reduction of administrative burden is therefore crucial to success.

In 2009 (Malmö) the ministers agreed on the following policy objectives to be met by 2015: (1) eGovernment services should be designed around the needs of users (citizens or businesses) and in collaboration with third parties; (2) eGovernment services should be user-centric, catering for the different needs of users (flexible, personalized, multi-channel, inclusive) and delivered in the most effective ways; (3) actively seek collaboration with third parties on the development of eGovernment services in order to stimulate innovation and maximize public value. The benchmark report of 2009 introduced the term “**user experience**” for the first time which goes beyond usability and accessibility. It was asked whether eGovernment initiatives were including “User Satisfaction Monitoring” and stated that “user-empowering technologies drive service development”.

Our future challenge will be to change the mindset of Administrations, and change the model of public services delivery to one that is clearly engaging and involving the customer in all aspects of the process. This opens the door to opportunities to reduce the cost-to-serve the customer, and improve service quality. We must go

over a ‘tipping point’ to reap such rewards, and in so doing move from an Administration-centric to a Customer-centric service delivery model.

However, the most recent declaration (Tallin, 2017) is rather reserved. It is stated that the most recent EU eGovernment Action Plan (2016) has been a “significant step in this transformation journey”. However, it is realised that “more needs to be done and faster to ensure its implementation”. The accompanying Benchmarking report shows no progress in the user experience. In addition to more user-centricity it also asks for

Citizen engagement: That digital means are used to empower citizens and businesses to voice the views, allowing policy makers to collect new ideas, involve citizens more in the creation of public services and provide better digital public service.

In sum, citizen-driven service development of public services has been promoted greatly at European and national level for the past decade. The examples above provide a glimpse into the ways in which Members States and the European Commission reiterate the importance of customer-centricity:

[...] the importance of a user presence is repeated over and over again in different shapes: involvement, empowerment, collaboration, flexible and personalized user satisfaction” (Gidlund, 2012, p. 12).

Part of the rationale for engaging citizens in service planning, design and delivery is that they would use of those services more. This is aligned with pragmatic considerations brought forward in participatory design: the input of users may increase a successful design outcome and encourages acceptance and use (Carroll & Rosson, 2007).

However, our understanding of how citizens may be engaged in meaningful ways is still relatively limited (Gooch et al., 2018). Gidlund (2012) argued that there was “little systematic discussion of who users are, what they do, how they interact and what it means to use eGovernment services” (p.12). In fact, if citizens do become engaged are education, income and socio-economic status still strong, positive predictors of their civic engagement (Kavanaugh, Carroll, Rosson, Reese, & Zin, 2005).

In addition, many of the eGovernment services are not used on a regular basis, but only once every couple of years. It is doubtful that citizens can be encouraged to engage in co-creation processes concerning such services, if they may not use the service for several years or at all.

1.3.2 Open Government & Open Data

The second governmental concept in which co-creation processes have become a policy objective is Open Government. It is attributed to Barack Obama who—in his first election campaign in 2009—had announced Open Government one of his goals, aiming to make government more transparent, participatory and collaborative (to some extent based on Open Government Data).

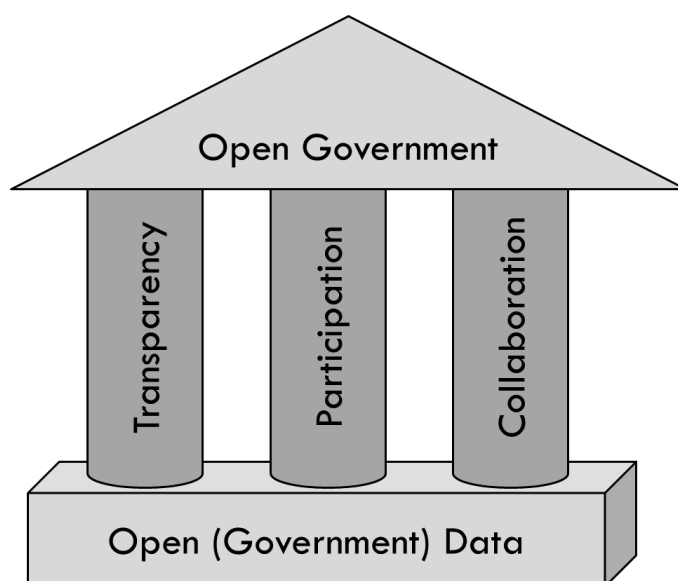


Figure 6: Principles of Open Government

On the day he took office, he obliged all federal authorities to make at least three relevant data records available free of charge for further processing via a central portal within 45 days (Office of the President 2009).¹ This broad understanding of OGD is primarily concerned with a fundamental cultural change of administrations from a culture of official secrecy to a culture of openness and transparency. It does not really matter what is meant by "data". In the narrower use of the term, however, this is precisely the central point. It is no longer about the documents that have been made accessible for many years under the Freedom of Information Act, but about data as characters that are machine-readable and can be further processed.

There are no details which government services have been developed or relaunched through co-creation in the US. The concept, however has been taken up by the Open Government Partnership, an association of more than 90 national and regional governments that have committed themselves to become more open and to develop a biannual National Action Plan in cooperation with civil society organisations, listing a number of projects in different areas of government. These plans are published and under review for achievements. Recently a "tool box" has been published as a guide of how to develop an NAP collaboratively, which uses the term co-creation in its title.

¹ As a side note, the acronym OPEN is taken from the OPEN Government Act of 2007 issued by Obama's predecessor George W. Bush (complete: Openness Promotes Effectiveness in our National Government Act of 2007), which adopted several regulations to improve the effectiveness of the Freedom of Information Act.

1.4 Different approaches to co-creation

In the following, we discuss the main approaches that have influenced ideas and methods for co-creation: **co-production of public services**, **co-design of information systems** and **civic use of open data (civic hacking)**.

1.4.1 Co-Production and co-creation of public services

1.4.1.1 Review

The take-up of co-creation processes in the public sector is occurring against the background of financial cuttings, the complexity of problems and the availability of new technologies (European Commission, 2014). Ansell and Gash (2008) have called this approach **collaborative governance**. Following “collaborative governance”, public agencies directly engage non-state stakeholders in a collective decision-making process. As Aichholzer and Strauss (2015) note, this definition includes all stages of the policy life-cycle and includes citizens as individuals as well as organised groups such as NGO’s or businesses. The involvement of citizens and their communities in the design and delivery of public services is often referred to as co-production. The concept of co-production is related to public services in the sense that since public services are characterised through a merger of production and consumption, they always depend to a minimum on the involvement of citizens. Co-creation is also employed to foster the inclusion of disadvantaged or marginalised people and groups of people. It refers to the collaboration of at least two partners, the public administration and the citizens. As such, co-production/co-creation of public services has to be distinguished from other forms of civic self-empowerment such as volunteer work or self-organisation, since in those activities the administration is not taking part (not co-creating).

Further, two types of co-production are identified; **substitutive co-production** as the outsourcing of work (and costs) and **additive co-production** as activities of the administration to enhance the impact of civic engagement. In this view co-creation in the public sector is understood as an impact-oriented form of collaboration between public administrations and citizens, that aims to unfold the capacities, potentials and strengths of all parties concerned with the objective of enhancing the quality of life in neighbourhoods, cities or regions, and to achieve efficiency gains jointly (Löffler, 2015, p. 319). Focusing more on the relationship of the co-production activities another definition refers to co-production as ‘the provision of services through regular, long-term relationships between professionalized service providers (in any sector) and service users or other members of the community, where all parties make substantial resource contributions’ (Bovaird, 2007, p. 847). Thereby the rapid development of ICTs can support these attempts to co-produce public services as it facilitates access to public data, enhances transparency and enables closer relationships and new forms of interaction between government and citizens. Hence, **co-creation of public services refers to the long-term involvement of citizens in problem definition and solving**.

In a comprehensive literature review on the co-creation/co-production of public sector services with citizens, Voorberg et al (2015) undertook a detailed analysis of 122 reports²

² Voorberg et al (2015) based their review on 5,358 articles in English-speaking journals and book chapters which appeared between 1987 and 2013 and which contained the word “Co-creation” or “Co-production” in its title or abstract. They found 1,337 reports on co-creation and 4,021 on co-production. Further selection criteria were involvement of citizens, public

covering all public sectors, but with a dominance in health care (30 cases) and education (15 cases). In 52 % of the contributions, **no objective is mentioned** at all. 29 % of the cases wanted to **gain more effectiveness or efficiency**, 8 % aimed for **more customer satisfaction** and only 7 % tried to **increase citizen involvement** (Table 1). The authors assume that in those cases where no objectives were mentioned explicitly **co-creation itself was the goal** and the justification, independent from any outcome (ibid, p. 1341).

Critical factors, influencing the course and goal achievement of projects are on the governmental side:

- Compatibility of public organizations with citizen participation, mentioned in 47 reports (46 %)
- Open attitude towards citizen participation (22 %)
- Risk-averse administrative culture (18 %)
- Presence of clear incentives for co-creation (win/win situation) (14 %)

And on citizens' side:

- Characteristics, e.g. skills, intrinsic values, marital status, family composition, level of education (33 %)
- Customer awareness, feeling of ownership, being part of something (30%)
- Presence of social capital (30 %)
- Risk aversion by customers, patients, citizens (seven %).

Actions to overcome barriers on the citizen side found in the reviewed literature include lowering the thresholds for participation, e.g. by offering a plebiscitary choice, instead of asking them about complicated policy issues, following an inviting policy to generate a feeling of ownership, and provide financial incentives. Voorberg et al. conclude that government not only has to overcome internal barriers but also has to enable, encourage and support citizens to get involved in co-creation.

1.4.1.2 Objectives & outcomes

Although 50 % of the reports mentioned some kind of objective **only 24 (20 %) report some kind of outcome** or impact. Among the different dimensions most frequently effectiveness is reported, i.e. the number of people reached, the amount of garbage separated or knowledge improved (Table 1).

Table 1: Goals and outcomes of co-creation processes (Voorberg et al. 2015, p.1341 and 1345)

<i>Co-creation objectives</i>	<i>Goal explicitly named (n = 122)</i>	<i>Outcome reported (n = 24)</i>
Gaining more effectiveness	22 (18%)	14 (59%)
Gaining more efficiency	13 (11%)	1 (4%)
Gaining more customer satisfaction	10 (8%)	1 (4%)

sector services, empirical findings, among others and finally led to 122 reports for detailed analysis (Voorberg, Bekkers, & Tummers, 2015, p. 1338).

Increasing citizen involvement	8 (7%)	6 (25%)
Strengthening social cohesion	n.a.	1 (4%)
Democratizing public services	n.a.	1 (4%)
Others	5 (4%)	
No objective mentioned	64 (52%)	

Voorberg et al (2015) started their review in order to identify whether the big hopes for co-creation – they speak of a „magic term“ can be based on evidence in order help public sector decision makers, decide whether and how to initiate such processes. In sight of this review Voorberg et al (2015) argue that it is not clear whether co-creation does indeed contribute to outcomes it aims to address. They further question, “if there is a relationship between several degrees of citizen involvement (co-implementing, co-design and initiator) and the outcomes of social innovations” (p.1348). The result is that in the majority of cases, co-creation is considered as a virtue in itself.

Public services are services provided by the public sector, which is defined „broadly as those parts of the economy that are either in state ownership or under contract to the state, plus those parts that are regulated and/or subsidized in the public interest“ (Flynn, 2007, p. 2). “Co-creation” and “Co-production” in these studies refers to the active involvement of end-users in various stages of the process (Voorberg et al., 2015, p. 1335). For the public sector they prefer to speak of „citizens“, as there are big differences between the private and the public sector. Co-production helps to make production more efficient when customers take over certain activities in the production chain or act as co-creators whose experience helps to make products or services more valuable. There is co-production in the public sector as well, for example in garbage separation, but in addition, co-creation by citizens here is considered to be also a value by itself as a kind of social innovation and civil engagement (p. 1334). Overall, co-production is about increasing efficiency, effectiveness and user/customer satisfaction of a service (no matter if public or private). Co-creation in contrast can include some of these aspects but it goes beyond them; the participation of citizens is an end in itself, because it aims to intensify one of the fundamental principles of democracy and civic participation.

While co-creation/co-production of public services is a promising and innovative idea and an option to react on the critique on bureaucratic burden, incomprehensible administrative forms and procedures etc., we learn from the literature review by Voorberg et al. (2015) that in general there is no evidence that the idea really works and that the desired results are achieved. The cases of co-creation and co-production reported dealt mostly with physical objects and direct human interaction.

The review of Voorberg et al. (2015) mentions influencing factors such as social capital and the need that government explicitly invites, encourages and supports citizens in their roles in a co-creation process. In sum, we follow Voorberg et al. (2015) to adopt a broader definition of the public sector, including those organisations under contract with the state or under regulation on the public side as well as intermediaries, social welfare organisations on the civil society side. We further **propose to consider the term “public services” as extended to services in the public interest and offered by social welfare organizations and other non-profit civic society organizations, which complement governmental services.** They have

lesser legal limitations and a stronger interest in involving citizens as this involvement strengthens their position when they ask for public funds to support their work.

1.4.1.3 The role of citizens in the co-production of public services

Voorberg et al. (2015) distinguish three different roles citizens may take in co-production:

- **Citizens as initiator**, refers to cases where citizens start an action and government follows, e.g. by restoring monuments, when the historical centre of Naples was reopened for the public.
- **Citizens as co-designers** are invited by government to collaborate, e.g. in the design and maintenance of outdoor recreation.
- **Citizens as co-implementer** perform some task in the implementation of a public service, e.g. in a garbage disposal services, where recycling only can be achieved if citizens actually separate different types of garbage.

The examples given in this literature survey happen in the real world and deal with physical activities. However, we assume that the findings also apply to the creation of digital services. The description of these roles follows the service development life cycle, in which citizens as initiator plan for services, citizens as co-designers collaborate in the building of a service and citizens as implementers collaborate in the running of a service.

1.4.2 Co-creation and Co-design

There is a long tradition of user involvement in Information System Development (ISD)³. Ever since the users of Information Systems (IS) became a different group of professionals from those that design and implement such systems, there was a gap between the expertise of professional software systems developers and prospective users. By involving users in the software design, their specific expertise about their work processes and how they may be supported can be fed into the requirements specification. Although user involvement usually involves higher costs, there is agreement that the outcome of such involvement leads higher user satisfaction and take-up.

1.4.2.1 Origins of Co-design and Participatory System Design (PSD)

The classical model of PSD dates back to the late 1970s with at least three different origins and approaches.⁴

- Enid Mumford at Manchester Business School described case studies of information systems which were not meeting the objectives of users, because system developers had a too narrow understanding of the requirements and identified a knowledge gap between users and systems developers (E. Mumford & Banks, 1967). To achieve a knowledge symbiosis, she worked as consultant and organised **co-operative system development** processes, published best practice cases (Enid Mumford, 1981; Enid

³ Since 1990 there is a bi-annual international conference on participatory design, started by Computer Professionals in Social Responsibility. The proceedings are available online at <http://ojs.ruc.dk/index.php/pdc/issue/archive> and show the great variety of thoughts and research findings on participatory design over 25 years, which cannot be summarized completely in this section.

⁴ The approaches can be compared by contributions of their proponents in a reader edited by Schuler and Namioka (1993).

Mumford & Henshall, 1979) and developed the **ETHICS-Method**. “System” is conceived as a socio-technical work system which has to meet the needs of an organisation and of the employees. The way to achieve this is structured into seven steps from (1) needs assessment, (2) identification of constraints and (3 and 4) specification of technical and social objectives via (5) check of compatibility between different technical and social solutions to (6) the detailed technical and work design and (7) evaluation (Enid Mumford & Weir, 1979). This approach may be classified as instrumental from a management perspective.

- In contrast the **Scandinavian approach** was based on political and philosophical considerations, emerging from a trade union perspective (Greenbaum, 1993; Kubicek, 1980). Within the context of office automation on one side and Industrial Democracy on the other, trade unions in Norway, Denmark and Sweden questioned whether the participation of employees should take place under the control of management and capital owners. They were in doubt on whether such process would indeed meet workers’ interest, since such systems could potentially replace them (Bjerknes & Ehn, 1987; Ehn, 1988). **Participation had to be regulated by technology agreements**, negotiated by trade unions and management, including job security, health and ergonomic issues of computer work stations and visual display units, qualification programs and more. In cooperation with a computer science department, trade unions set up projects to explore user participation in this contexts and developed new methods. Most famous are the **DEMOS** and the **UTOPIA Projects** (Ehn, 1988).⁵
- In the US, elements of the British and the Scandinavian approach were integrated in the **Quality of Work movement**. Because of the much lower degree of unionisation there was no chance of union involvement in systems and work design (Greenbaum, 1991). Rather the transfer was limited to the idea of merging the different views of system analysts and users in particular for the development of (management) information systems where users have much more discretion in how they use the information and functions of these systems compared to more deterministic legacy system in accounting or for order processing. Greenbaum speaks of “**Cooperative Design**” (Greenbaum & Kyng, 1991).

Despite differences between the approaches, they all focus on the development of individual software for intra-organisational information systems within a company. The development is conducted either by an internal IT Department or via an individual contract with a developer company. In such processes, the user departments are well-defined; representative users can be assigned to such participatory or cooperative design projects.

In the last thirty years, software development has moved from an individual craft to industrial production. Instead of developing bespoke software, organisations now purchase standard software products (e.g. from SAP or Microsoft). In these cases, there is not much discretion regarding the design of functions and interfaces on the organisation’s side and therefore only limited options for participative or cooperative systems design. In contrast, work processes often have to be adapted to the software system and this re-design and process-re-engineering may become subject to employee participation.

⁵ Morton Kyng and colleagues from the Computer Science Department at Aarhus University in Denmark collected new methods for cooperative design between computer specialists and employees, which had been developed in these trade union projects such as Future Workshops, Organizational Games, Mock-up-Designs and Cooperative Prototyping in order to allow for a full understanding of the future system in the planning process by the participating employees and systems analysts at the same time (Bødker, Grønbaek, & Kyng, 2012).

As a counter movement to the software industry, software developers have founded the Open Source movement and among others collectively developed the operating system Linux and applications such as OpenOffice. In this movement, new network-based forms of cooperative software development are practiced. However, this cooperation is limited to developers and does not include end users and there is little research on end-user involvement in Open Source development. This might change with the Open Data Movement (see chapter 1.4.3).

1.4.2.2 Engaging extra-organisational users

In recent years this setting has changed as software projects target users outside of organisational boundaries (e.g. digital public services). This has led to new challenges with respect to participation and cooperation between software developers and prospective users. Information systems for E-Commerce and EGovernment services target users who are not members of a specific organisation. Yet, the development of such services faces similar challenges with respect to understanding prospective use context and use practices.

A main challenge to software development for extra-organisational users is that traditional PSD models relate to intra-organisational development of intra-organisational information systems: Internal users can easily be identified, are assigned by their managers to a project, which takes place at their work place and during paid working hours. They are motivated to participate because they learn first-hand about changes of their future job and have a chance to influence this change. In contrast external users are more difficult to identify and motivate. They use an online service only occasionally and can potentially opt-out. Kubicek and Taube have called them “occasional users” (Kubicek & Taube, 1994). For a number of reasons it is more difficult to involve extra-organisational users in the co-design of information systems: (1) participation requires time and usually requires a commute to where the co-design intervention takes place; (2) participation requires to engage with people that do not necessarily know each other; (3) participation requires engagement with software developers and software development, a topic area not familiar to most people.

There is only very little research on co-design with external occasional users. Early case studies of a school information system and a one-stop government service centre in Germany demonstrated that in both cases, users (parents and citizens) were reluctant to participate in the design of these systems (Breiling, Haunhorst, & Membrey, 1979). (Stark, 1998) reports on financial, schedule and information barriers and doubts the legitimacy and effectiveness of the participation of patients in the development of a patient health card.

There are only a few examples of successful user involvement, usually working with communities and leaving a dominant role to the researchers/designers (DiSalvo, Nourbakhsh, Holstius, Akin, & Louw, 2008; Merkel et al., 2004). There are research papers presenting appropriate tools and methods to involve occasional users such as personas, cultural probes among others (Clement, McPhail, Smith, & Ferenbok, 2012). However, there is no consensus about the appropriateness of these methods. For example, Bødker et al. (2012) doubt whether personas are helpful in designing public services because those defining the personas cannot really comprehend and represent the heterogeneity of the target population and future users. This is in line with reports that in the case of user participation in government services, government officials doubt the relation between user participation and later acceptance because nobody can tell to which extent the people who are ready to participate represent the target user group of a service (Gidlund, 2012).

1.4.2.3 Objectives

Following on their historic roots, the goals of participatory design include moral as well as pragmatic considerations. Vines et al. (2013) list the following aspects which—to a differing degree—build the rationale for participatory design projects: (i) the sharing of control with users; (ii) the sharing of expertise and (iii) individual, organisational and technological change (Vines et al., 2013). Similarly Bratteteig and Wagner (2016) argue that participatory design aims at “creating choices” and “sharing power” in order to create “better participatory results”.

Sharing control with users

Rooted in the political agenda of Scandinavian participatory design, one of the main aims of participatory approaches is the destabilisation of power structures by sharing control over the design process and outcome (Vines et al., 2013). This is grounded in a moral proposition: Participatory design is commendable because “the people whose activity and experiences will ultimately be affected most directly by a design outcome ought to have a substantive say in what that outcome is” (Carroll & Rosson, 2007, p. 243). Humans ought to be regarded as “actors”, not “factors” (Bødker, 2006). This moral imperative is present in many of the calls by funding agencies and has been inscribed into policy frameworks. It is hence important to consider the institutional framing of participatory projects in order to understand “the sources of power and influence different project participants were able to mobilize” (Bratteteig & Wagner, 2016, p. 429). This includes considerations about the (hidden) agendas participants may have.

Sharing expertise

To include future users’ input in the design process makes also sense pragmatically as it said to increase the chances of a successful design outcome by taking into account their “expert perspectives and preferences regarding the activity that the design will support, and most likely transform” (Carroll & Rosson, 2007, p. 243). Pragmatically hence, it is argued that “having the users participate makes it easier to implement the design result” (Bratteteig & Wagner, 2016, p. 426). One of the most common ways of eliciting users’ expertise are workshops in which teams of researchers, designers, system developers, future users and other stakeholders come together to identify challenges and develop new ideas. In these workshops “boundary objects” (Star & Griesemer, 1989; Jarke & Gerhard, 2018) are co-developed that act as “shared articulations of knowledge of those participating in the design process” (Vines et al., 2013, p. 430). Depending on the design context and the quality of user participation, the interpretative weight of the design team differs.

Enabling individual, organisational and technological change

Finally all historic participatory design approaches recognise that participatory design processes are motivated by enabling (or enforcing) some kind of change. Participatory design hence needs to understand peoples’ current practices, experiences and how future design products may become appropriated (Vines et al., 2013). Participatory design approaches aim to enable users to improve their current practices and circumstances and as such include an interventionist element (for example, notable in action research projects).

1.4.2.4 The role of users in participatory design

Overall, it “often remains unclear what it is that users participate in, what and how they contribute to the design result, and how they can see that they have contributed” (Bratteteig & Wagner, 2016, p. 426).

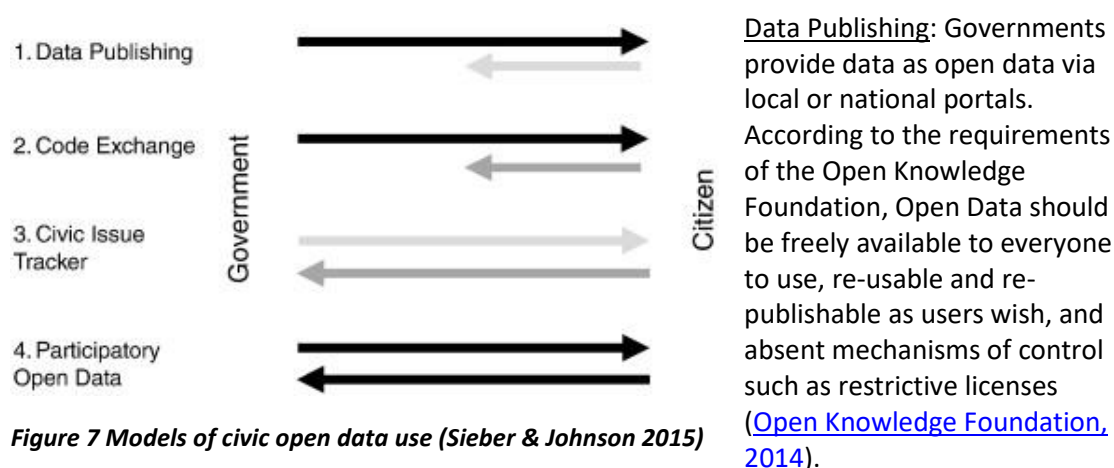
1.4.3 Civic open data use: Civic Hacking

1.4.3.1 Modes of civic open data engagement

Many administrations or governments provide part of their data under open licenses, so that technology-savvy citizens may use and re-use it. While the role of public administration is somewhat reduced in this scenario, so-called civic hackers are “deploying information technology tools to enrich civic life, or to solve particular problems of a civic nature” as Hogge (2010, p. 10) noted in a study commissioned by the Open Society Foundation. As such these civic hackers are political activists that aim to support their communities through digital means; they are—in a way—an “elite” that is capable of apprehending the meaning and possible uses of open data, and subsequently act on it (Schrock, 2016).

Civic technology is strongly associated with the digitalisation of the public sector in general and the idea of “open government” in particular. Interactions between public authorities and citizens are increasingly mediated by digital technologies as more and more public services are provided via digital channels. However, in many cases these services are not used widely and in particular, older citizens are excluded above average, as digital services do not meet their needs and expectations. Recently the idea of ‘open government’ (European Commission, 2014; House - Oversight and Government Reform, 2007; Office of the President, 2009; Presidential Directives EO 13392, 2005) has attracted attention, encouraging the development of so-called civic apps (digital applications that are based on open government data and developed by civil society actors such as Code4America). These civic apps are meant to provide for better and user-centred services and to foster public participation and engagement in the development and provision of public services through the use of open government data.

There are different models on how government and citizens may interact with respect to open data. Sieber and Johnson (2015) distinguish four models (Fig. 7):



Code exchange: Government explicitly encourages the development of saleable or internally useful products based on its provision of open data as mentioned in the introduction. The provision of data is accompanied by promotional or other forms of supportive activity and is often framed in the context of an “app” contest, i.e. apps developed by a developer community, including private business and civil society. It is a kind of outsourcing app development by government.

Civic Issue Tracker: In this model, the direction of interaction is reversed. Government invites citizens to report problems like potholes or noise complaints or to give feedback on published

data and documents. This model may be applied independently from the two previous models, but can also be combined, when citizens are invited to act as „sensors of their environments“ and report data on phenomena they are physically close to in a crowdsourcing approach.

Participatory Open Data: Here open data is reciprocal. Data provision from authoritative sources may be followed by a request for additional data and be amended by citizen-generated data that can support service delivery and open a new channel for discussions about policy. This can take place in a co-management framework and includes the on-going co-creation of raw data between both governments and governed and the co-production of services (Sieber & Johnson, 2015).

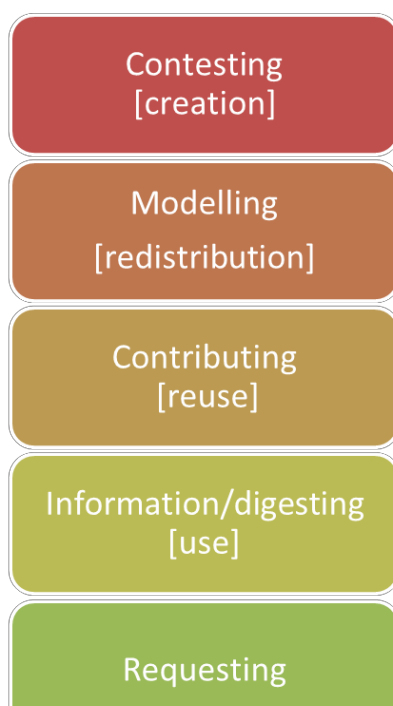
Sieber and Johnson see governments „at a crossroad“ taking a choice between these models, as they are driven by different motivations: The **first two models are motivated by the call for transparency** based on freedom of information requirements and/or providing resources for economic development. The **third model is motivated by a concern for more responsive relation** of government to its citizens while the **fourth model demonstrates a fundamental change of the role of government** and calls for a degree of flexibility, which is hardly found. However, the authors promote the “Participatory Open Data Model”, because the first two models pose the risk that governments „outsource themselves“. If, for example, Google collects all transport data and offers public transport information, people may start asking why they pay taxes if others provide public services for free. In the authors’ view, the forth model is a necessary reaction to ongoing changes in the digital word and in line with the principles of the Open Government Partnership.

Governments are placing an increasing emphasis on opening their data repositories so as to encourage new forms of service design and delivery (Shakespeare, 2013). A growing number of cities are making their data openly available. However, such open data is normally read-only (that is, citizens are usually not able to easily suggest changes, correct errors, etc.) and there is little return for local governments (Lee, Almirall, & Wareham, 2015; Hunnius & Krieger, 2014). Often developers anticipate the needs and wants of citizens based on their own experiences with lack or insufficient knowledge about prospective user groups. In order to create value that benefits administrations as well as citizens, it is crucial to engage citizens in the process of open data service app development, especially those who are often forgotten when it comes to technological innovations.

Nevertheless, this model is in conflict with the established structures of representative democracy and the rule of law: If citizens are invited in this way as co-producers, they expect that government will follow their suggestions and contributions. However, it is open how to deal with conflicting demands and how to give the silent majorities a voice. For example, issue trackers are much more popular in those parts of a city where people with higher socio-economic status live. Studies have demonstrated that after the introduction of issue trackers, those parts of the city are more likely to receive attention by public authorities (Marres, 2017).

Those who volunteer as co-producers have no mandate from their co-citizens but may pursue their individual interests. According to the existing law, the decision which services are provided by local government has to be taken by the elected council within the approved annual budget according to procurement law. Any proposal for new services has to be considered and finally decided within these limits. This may be one of the reasons why the fourth model so far has almost not been realised.

1.4.3.2 The role of citizens in civic open data use



The idea that people outside an organisation are involved in the development of information services, is prominent in the context of civic tech, where so-called civic hackers use open government data to design civic apps which offer and, at times, substitute for public services (Schrock, 2016). In principal civic tech may involve anybody “who is willing to collaborate with others to create, build, and invent open source solutions using publicly released data, code and technology to solve challenges” relevant to their neighbourhoods, cities or states. Hence it aims to engage citizens (also with non-technical backgrounds) in practices relating to different levels of open data use such as the requesting, digesting, contributing, modelling, and contesting of open data (Schrock, 2016). However, civic tech apps are mainly developed in app competitions and hackathons (often run by public administrations) or through continuous civic tech work such as CodeForAmerica. Software development in such settings is rarely participatory and the resulting apps do not necessarily relate to the needs of other citizens (Lee et al., 2015).

Figure 8: Levels of civic open data use (based on Schrock, 2016)

In those cases where citizens are involved they act as data collectors (e.g. Gooch et al., 2018). Their review of how citizens may engage with (public) data in smart cities is grounded in work around smart cities. Here the idea of citizen science and the use of sensor technologies/IoTs is prominent. It is different to Schrock’s proposals (based in a data activists framework) in which citizens engage with open government data in an increasing sophisticated manner (from merely requesting it, to its use, re-use and potentially contestation). However, the idea of citizens as data collectors may also be found in the idea of citizens as sensors of their environment, e.g. in the case of the civic issue trackers discussed above.

1.4.4 Objectives of co-creation approaches

In this chapter, we have provided an overview about the objectives of some of the roots of co-creation. So far, there is no established definition of what co-creation is, no defined set of methods, methodologies and objectives. Rather, each of the projects we reviewed followed their own way of translating the objectives or methods in which their approach is rooted into their own activities. This study does not aim to give a definite answer on what co-creation is, but rather aims to discuss some of the challenges such a complex and all-encompassing approach may encounter. Figure 9 below summarises the goals of some of the approaches in which co-creation projects situate themselves. As can be seen they cover different phases in the life cycle of service planning (plan), design (build) and provision (run).

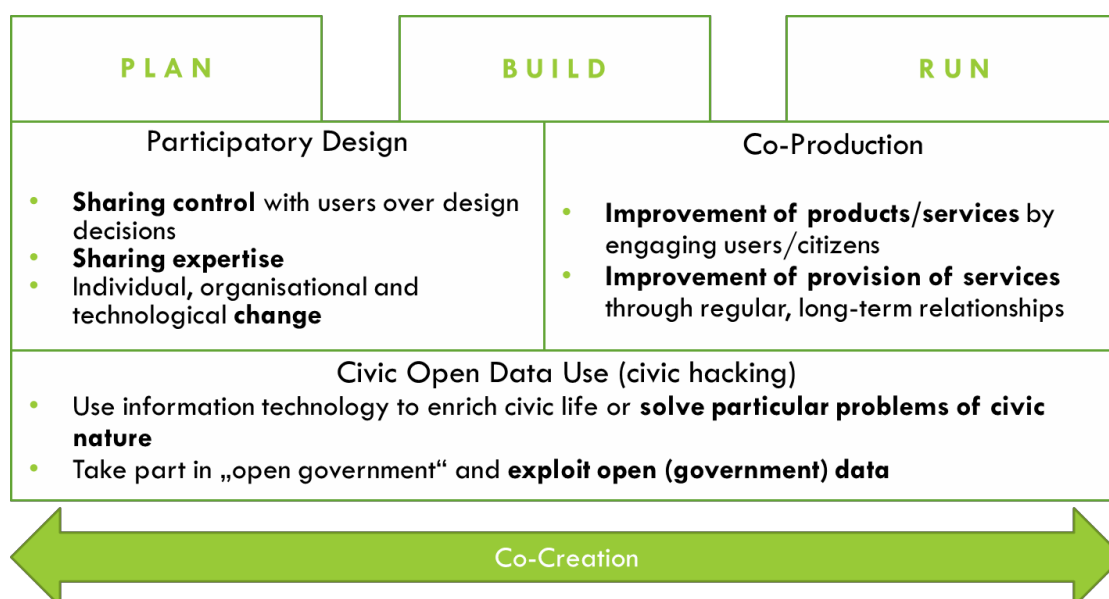


Figure 9: Comparing objectives of co-production of public services, participatory design and civic hacking

1.5 H2020-funded projects pursuing co-creation in “ICT-enabled public sector innovation”

In the same funding line as our project, there are several others that are aiming to either **enable co-creation through the development of digital tools and platforms** or to **conduct co-creation by attending to the development of digital tools as well as co-creation methods/methodologies**. For our review, we selected those projects within the funding line which indicated in their description on CORDIS that they conducted or enabled co-creation in the area of eGovernment/Open Government. Furthermore, we analysed those projects (also from other H2020-funding lines) with which we have signed collaboration agreements because of the close alignment of our work.

Out of the nine projects, only five **conducted co-creation** processes as part for their activities. The other four developed digital tools or platforms for **enabling co-creation**. In most of the projects, the concept of co-creation is not well-defined, if at all. The table below provides a brief overview on the projects, presenting their objectives, approach to co-creation, through which means co-creation is meant to be enabled (e.g. technology, social innovation) and whether the projects have actually conducted their own co-creation projects.

Table 2: Overview of H2020-funded projects engaged in co-creation of public services

Name	Objectives	Co-creation approach	Enabling co-creation	Conducting co-creation?
OpenGovIntelligence (2016- 2019)	<ul style="list-style-type: none"> Enabling open government data driven co-created public services Allowing for better utilization of OGD for public service production through the collaboration of citizens, companies, and governments 	<ul style="list-style-type: none"> Focus on data (utilization) and citizen engagement in service production and provision > collaborative public service creation 	<ul style="list-style-type: none"> Yes, enabling future co-creation through the OGI innovation ecosystem that contains <ul style="list-style-type: none"> a data infrastructure architecture for LOSD (Linked Open Statistical Data) and data-driven public services. a toolkit of APIs for accessing, using and converting data A co-creation framework that describes the processes, policies, strategies, and data infrastructure architectures of the innovation ecosystem and provides guidance for the collaboration of the different stakeholders 	☑
ROUTE-TO-PA (2015 - 2018)	<ul style="list-style-type: none"> Improving the engagement of citizens by enabling citizens to engage in open government through supporting their access to open data 	<ul style="list-style-type: none"> Focus on data (utilization) and citizen engagement in open government (increase active participation of citizens - transparency, opinion building, decision making) 	<ul style="list-style-type: none"> Yes, the Social Platform for Open Data (SPOD) enables social interactions among citizens around open datasets coming from different sources (dataset providers) 	☒

Name	Objectives	Co-creation approach	Enabling co-creation	Conducting co-creation?
Smarticipate (2016 - 2019)	<ul style="list-style-type: none"> Enhance citizen involvement in urban planning (citizens suggest and propose) Increase interaction between citizens and public administrations 	<ul style="list-style-type: none"> Empower citizens, NGOs and businesses to support the decision making and production of tools and services 	<ul style="list-style-type: none"> Yes, the smarticipate app is a community engagement platform for communication and development in urban planning. Based on open data it provides citizens with information on proposed urban planning, citizens are informed, can comment on and make suggestions for changes 	<input checked="" type="checkbox"/>
WeGovNow (2016 - 2019)	<ul style="list-style-type: none"> Enhance and expand the viability of and capacity for citizen co-production in the public sector 	<ul style="list-style-type: none"> Citizens are partners in the delivery of public services > Mutual support of the public sector and civil society 	<ul style="list-style-type: none"> Yes, enables civic engagement through a platform that integrates civic engagement applications which existed already prior to the project and software components that were newly developed by the project 	<input checked="" type="checkbox"/>
WeLive (2015 - 2018)	<ul style="list-style-type: none"> Stimulate economic activity around public service Bridge the gap between innovation and adoption (i.e. take-up) of open government services 	<ul style="list-style-type: none"> Stakeholders (public administrations, citizens and entrepreneurs) collaborate in the ideation, creation, funding and deployment of new services 	<ul style="list-style-type: none"> Yes, the service to be developed is a WeLive environment that empowers citizens and businesses to directly participate in the design, creation, selection and delivery of public services 	<input checked="" type="checkbox"/>

Name	Objectives	Co-creation approach	Enabling co-creation	Conducting co-creation?
SoCaTel (2017- 2020)	<ul style="list-style-type: none"> Improve the accessibility, responsiveness, efficiency and transparency of social and care services 	<ul style="list-style-type: none"> Collaboration of different stakeholders throughout the process, from design through to development and testing, and onto implementation of services 	<ul style="list-style-type: none"> Yes, through developing a platform in which service users, care professionals, researchers and innovators will collaborate on improving social and care services 	☑
CoSIE (2017 - 2020)	<ul style="list-style-type: none"> Advance the active shaping of service priorities by end users and their informal support networks, Engage citizens, especially groups often called 'hard to reach', in the collaborative design of public services 	<ul style="list-style-type: none"> Engaging diverse citizen groups and stakeholders in service production 	<ul style="list-style-type: none"> Yes, through the utilization of blended data sources (open data, social media) with innovative deployment of ICT (data-analytics, Living Lab, Community reporting) 	☑
CITADEL (2016 - 2019)	<ul style="list-style-type: none"> Provide stakeholders with more efficient, inclusive and citizen-centric services 	<ul style="list-style-type: none"> Involvement of citizens and other stakeholders in the creation or modification of the public services 	<ul style="list-style-type: none"> Yes, through the provision of guidelines for public administrations with the aim of improving the services 	☒

<i>Name</i>	<i>Objectives</i>	<i>Co-creation approach</i>	<i>Enabling co-creation</i>	<i>Conducting co-creation?</i>
Organicity (2015 - 2018)	<ul style="list-style-type: none"> Provide a platform for collaborative experimentation on ICT solutions for the city 	<ul style="list-style-type: none"> Combination of top-down planning and operations with flexible bottom-up initiatives 	<ul style="list-style-type: none"> Yes, through the development of a platform that allows citizens, small businesses, corporations and city authorities to experiment with urban data. Everyone can test their ideas for databased IT-solutions of urban challenges. The technical environment provides tools and APIs that enable experimenters to develop websites, web services, desktop applications or smartphone applications. A guidebook ("playbook"/framework) for the co-creation process is provided as well 	<input checked="" type="checkbox"/>

Out of those nine projects, we analysed those projects more thoroughly which already provide a good documentation (as some projects started only a year ago, there is very little documentation on their activities so far). From the remaining four projects, only two conducted their own co-creation activities. The other two, developed digital tools or platforms to enabled co-creation.

<i>Name</i>	<i>Enabling co-creation</i>	<i>Conducting co-creation</i>
Organicity	<ul style="list-style-type: none"> Yes 	<input checked="" type="checkbox"/>
OpenGovIntelligence	<ul style="list-style-type: none"> Yes 	<input checked="" type="checkbox"/>
Smarticipate	<ul style="list-style-type: none"> Yes 	<input checked="" type="checkbox"/>
WeLive	<ul style="list-style-type: none"> Yes 	<input checked="" type="checkbox"/>

OpenGovIntelligence and WeLive have both conducted co-creation projects and in so doing defined stages/phases for co-creation.

Table 3: Examples of co-creation phases from H2020 co-creation projects

<i>OpenGovIntelligence</i>	<i>WeLive</i>
1. Co-initiation <ul style="list-style-type: none"> Problem and needs identification Idea generation for ways to solve problems (informed by data) 2. Co-design <ul style="list-style-type: none"> Input to service design 3. Co-implementation <ul style="list-style-type: none"> Uploading user data Suggesting changes to data sets Data creation for a service 4. Co-evaluation <ul style="list-style-type: none"> Providing feedback to service quality, usefulness, etc. 	1. Co-experience <p>Mutual understanding of the problems and needs of service providers and users, using Questionnaires, focus groups/Idea forming workshops</p> 2. Co-definition <p>Define a representation of the service with use cases</p> 3. Co-development <p>Integrating the various components that make up the service (design game, online-workshops, Hackathons, contests)</p> 4. Co-delivery <p>Service providers as well as users deploy the co-created service</p> 5. Co-evaluation <p>Support the continuous improvement of the service (its quality and social impact)</p>

In the co-initiation phase of OpenGovIntelligence, statistical analytics of social media data are used in order to identify problems and needs. In workshops with potential users, ideas for new public services that may solve these problems are generated and designed. User stories and personas are applied here. Furthermore, ideas are collected on public meetings. In focus groups, data to contribute in the design of public service delivery are collected. The idea is that the service provider (“vendor”) which is the public administrations invites citizens (“clients”) to these focus groups. Through the application of a user-centered design approach, where users are involved in the design and development processes the usability of the service is to be ensured. For the evaluation, web and phone statistics as well as interviews and questionnaires are conducted. Also, a web portal provides feedback mechanisms for users. (Krimmer, Kalvet, McBride, & Toots, 2016; Matheus, 2016).

These examples show the scope of such co-creation projects goes well beyond any of the individual approaches of co-production, co-design or civic open data use though each of these approaches are important and are re-presented in the phases of the co-creation projects.

1.6 Mobile Age co-creation methodology

Summing up on our review above, we can determine that when it comes to co-creating digital public services based on open data there are a number of streams of activity that need to be considered. These streams are not sequential but run in parallel and inform each other.

- The first stream of activity concerns the **governing and managing of a co-creation process**. This includes the exploring and scoping of the project, the planning of resources as well as considerations about ethics.
- The second stream of activity covers the **continuous recruitment and engagement of stakeholders** throughout the co-creation process.
- The third stream concerns the **co-creation of a service concept**. This includes the development of ideas about the service to be co-created based on the needs and requirements of older citizens and intermediaries, the definition of a (rough) service concept and the subsequent refinement of this concept. This is based on approaches to *co-producing public services*.
- The fourth stream is concerned with **(open) data**. It includes the identification of existing and missing data, the collection, validation and quality checking of data, the creation and integration of open data as well as the editing of data and information. This is grounded in work on *civic open data use/civic hacking*.
- The fifth stream is concerned with the **co-creation of software**. This includes the identification of desired functionalities, prototyping and user testing and is based in approaches to *co-design/participatory design*.
- The sixth stream of activity concerns **evaluating of the co-creation process and its results**. This is a continuous activity throughout the whole process and very much embedded in our approach to co-creation as a reflective practice (see chapter 2).
- In addition, a co-creation process needs to include activities pertaining to **exploitation and dissemination**. Finally, the **service provision** needs to be considered.



Figure 10: Streams of co-creation activities

1.7 From citizens as users to citizens as co-creators

The success of participatory projects depends on the involvement of appropriate and representative users (Gidlund, 2012). However, the ways in which users are constructed in each of the co-creation approaches presented above is very different. The roles citizens as future users of a digital public service may assume differ from other forms of citizen participation but also from other forms of participatory software development as their involvement spans over the service planning, design and provision (Gomillion, 2013):

- (1) Traditionally, end-users only provided information on needs and requirements and gave feedback while the experts (designers, software developers) performed the programming and design-related tasks. In co-creation, end users may also be involved in programming and design activities themselves.
- (2) End-users define or influence the architecture of the system, not only single features and interfaces.
- (3) End-users take over responsibility for the services and systems developed and may maintain (certain aspects of) it.

While participation in some co-creation initiatives is limited to co-design of the interface of an application, others also involve citizens in generating topics and contents. Hence, participants can take different roles in the co-creation process. In general the **roles citizens may assume**

have been either defined along the service design and provision process – plan, build, run (e.g. Voorberg et al., 2015):

- Citizens as initiator
- Citizens as co-designers
- Citizens as implementers

or with respect to specific tasks – exploring, forming ideas, designing, diffusing (e.g. Nambisan & Nambisan, 2013):

- Explorer: Identify problems to be solved
- Idea former: Generate solutions to well defined problems
- Designer: Design and/or develop implementable solutions
- Diffuser: Facilitate the adoption and diffusion of the developed solution

These roles may be assumed at different times of a co-creation process. During the planning for a co-creation process, citizens may be involved as initiators or explorers, while in the subsequent phase they may be involved as idea formers and co-designers. Lastly, citizens may be involved as implementers or diffusers of services. In addition, the role of a data curator (as defined in the approach to civic open data use (chapter 1.4.3) is also relevant to Mobile Age's objective to co-create services based on open data. We have hence defined the following roles:

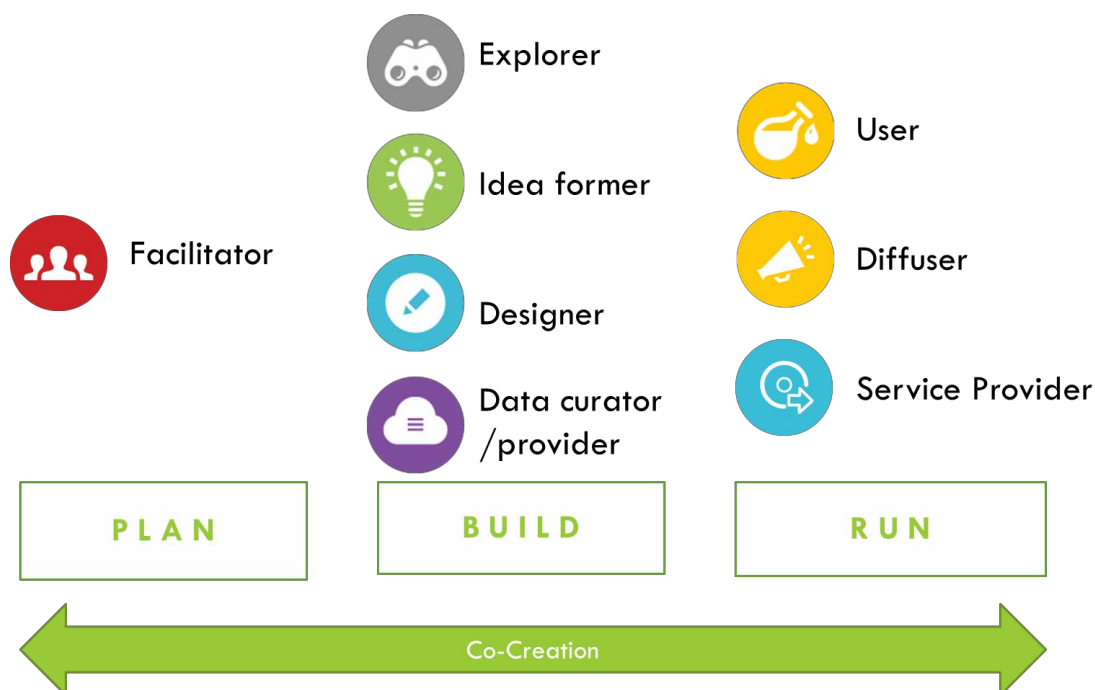


Figure 11: Roles of citizens per co-creation phase

The degree of user involvement and their agency and control differs substantially across participatory design contexts. For the purpose of this study, it is not only important to consider potential roles citizens (or other co-creating stakeholders) may assume but also how these roles may be performed.

As the unicorn, the participating citizen is easily imagined but difficult to track down in practice. The betrayal is however, two-folded, not only do the symbolic and discursive nature of 'citizen driven development' fail the practitioners, but the citizens are also down in several ways. The abstract concepts of use and user put forward in images and ideographs legitimate particular practices while discouraging others. In this case citizens might be motivated to participate in a number of areas but when they do so these are not acknowledged and made visible since they are not estimated profitable by the public authority (Gidlund, 2012, p. 18).

In addition, to how citizens are assigned particular roles through e.g. methods, co-creation processes differ with respect to the *degree* to which the participating parties are involved. The degree of involvement depends on the

- 1) **Structure and frequency of interaction:** Co-creation processes differ with regard to the duration and intensity of interaction. With regard to the creation and design of public online services for example, there may be a series of workshops with different objectives and participants or a regular project with a defined goal and termination, running over several months with the same team.
- 2) **Abilities and interest of the people involved** (levels of creativity): People can get creative at varying levels in different stages of the process and with respect to the amount of expertise and interest for certain tasks.
- 3) **Equality of the parties** (access to information and transparency).
- 4) **Openness of the task and predictability of the solution:** Depending on the openness of a task the solution is more or less predictable.

The specific **degree of involvement** depends on the **frequency and structure of interaction**, the **abilities and interests** of the participants and the **openness of the task**, and has differed across the four Mobile Age field sites and between phases.

1.8 Co-creating with older adults

1.8.1 Participants and other stakeholders in co-creation processes with older citizens

The focus of Mobile Age is on digital information and communications services at the local level, i.e. towns, cities and regions, as this is the most important living environment for senior citizens.

Besides older adults as co-creators broadly representing the target audience, there are other participants and stakeholders that have to be involved if the service developed shall be comprehensive, sustainable and embedded in the neighbourhood (Fig. 12).

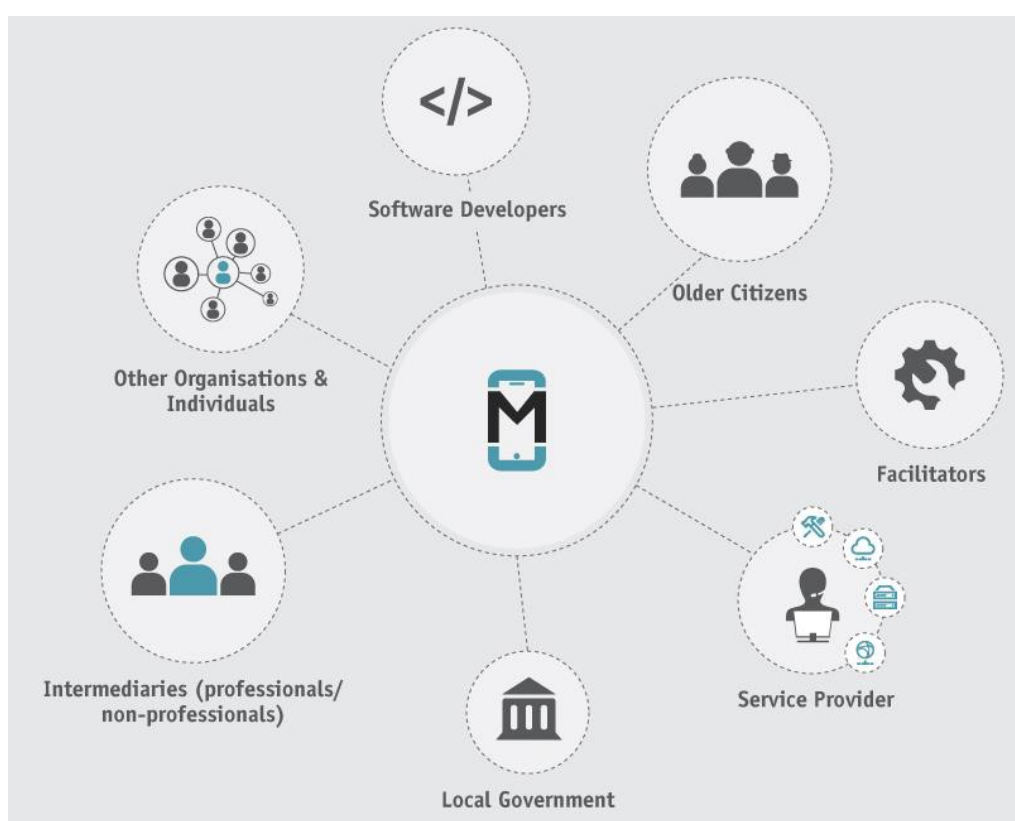


Figure 12: Stakeholders in co-creation of open data-based public services

Intermediaries serve as **information brokers** and provide information about services, events and resources in digital or printed formats to different groups of older adults. They may be professional neighbourhood managers, social workers in the field of elderly care or volunteers in community building, editors of community newsletters or city web portals, but also family members and acquaintances. Intermediaries are the second target audience and user group of the service to be developed as it should support their daily work. Considering the Digital Divide, they play an important role in making the content of a co-created digital service available to older citizens. It is hence important, that they provide input for specific tasks in the co-creation process.

In many cases, **local/regional government** units will be initiating and managing the co-creation activities to provide financial resources, become the owner of the new service and

maintain it. There are a few roles they either may take themselves or engage outside partners.

A co-creation process needs **facilitators** as convenors and moderators. Facilitators in our context are either the researchers themselves or experienced individuals in the work with older adults and/or groups. They support the co-creation activities through e.g. running workshops, focus groups, interviews.

A digital service needs **software developers**. Developing a user-centred application may be undertaken by IT-departments of the local government, commercial companies or civil society organisations such as the Open Knowledge Foundation.

Service providers are offering services to older adults in the neighbourhood. They include government units, utilities like transport providers, social welfare organisations, religious congregations, NGOs, and commercial business (cafes, pharmacies etc.). They are the subject of the information service to be co-created. They provide information about themselves and the details of their services and they have to agree to the publication of these data.

Finally there are **other organisations & individuals** that have to be engaged for providing missing information, financial resources or support the use and outreach of the service, including for example senior citizens' organisations, senior citizens' clubs (e.g. computer clubs) but also media and journalists that may report about their co-creation activities and the service and politicians engaged on social policy and elderly care.

1.8.2 Older adults in participatory design

Demographic ageing has been established as one of the main challenges to contemporary Western societies by politicians, journalists, industries and academia alike. Associated fears of the financial burden to social security and health care systems are prominent. At the same time, demographic ageing is depicted as promising financial opportunities through the so-called "silver economy". Technology design and the development of new technologies have—throughout human history—been envisaged as ways of responding effectively to (societal) challenges, problems and obstacles. In particular, information and communication technologies are amongst those that are viewed to have changed social order and sociality profoundly. They are also situated in a discourse of innovation and progress.

Not surprisingly have many sought to develop technological solutions as response to the perceived challenges and opportunities of an ageing population. These responses span from robot companions to address loneliness (Turkle, 2011). Most of these technological solutions frame ageing 'as a "problem" that can be managed by technology' (Vines, Pritchard, Wright, Olivier, & Brittain, 2015, p. 2) This is very much in line with mainstream gerontology which focusses e.g. on biological ageing rather than the 'impact of social and cultural conditions on growing old' (p.3). In a comprehensive review of 644 papers covering human-computer interaction (HCI) and older users, Vines et al. (2015) find that most research reinforces particular stereotypes of ageing and subsequently limits 'our understanding of how older people might experience, live with, use and actively shape and design technologies both now and in the future' (p.16). and subsequently limits 'our understanding of how older people might experience, live with, use and actively shape and design technologies both now and in the future' (p.16).

Most software development projects are based on the designers' assumptions regarding older people's needs. Östland et al. (2015) warn that by using such technologies dependencies may be reinforced and older users are kept "hostage". For example, Vines et al.

(2015) emphasise the risks associated with reductionist accounts of human beings as users of IT systems:

“While defining the user of a new technology can be beneficial in characterising its use cases, it has been long argued that this comes with the danger that heterogeneous and multifaceted human beings are reductively portrayed only in relation to the systems they use and how they are allowed to use them” (Vines et al., 2015, p. 2).

Critical scholars in STS-inspired social gerontology but also human-computer interaction hence demand a more critical engagement with technology design for older adults (Neven, 2011; e.g. Peine, Faulkner, Jæger, & Moors, 2015; Vines et al., 2015). In particular they question the representations of “age” that are often scripted into the technologies and call attention to the potential consequences of their use. Engaging older adults prior to the design process, embraces alternative measures and attributes of ‘success’ in later life” (p.20)

Thus, the step towards a participatory design perspective is viewed as tremendous progress in the area of technology design for older users. Researchers, developers as well as funding agencies consider the social context of technology development and use as integral part of their agendas. At the same time of a growing interest in the social context of technology appropriation and application, we experience a change in discourses around ageing: Increasingly the image of the frail, lonely and dependent elderly is accompanied by the notion of an active, healthy and capable older person. This new ideal of growing old in contemporary society has been contested in gerontological research ever since (Katz, 2000). Amongst others, these changes and extensions to the meanings of becoming old reveal the diversity and heterogeneity amongst the group of older people.

1.8.3 Civic open data use and older adults

The field of civic open data use (civic tech/civic hacking) is mainly dominated by younger and tech-savvy “civic hackers” that develop services for their communities and cities (Gooch et al., 2018; Lee et al., 2015). In our project, we were interested in exploring how the service ideas, value propositions of digital services and the underlying open government data change when future users become co-creators; how they may challenge stereotypical assumptions of older users.

Older citizens—if at all—are often only marginally involved in such kind of civic technology engagement. They very rarely constitute the focal user group of civic apps; commercial web applications mainly focus on their assumed deficits and limitations (e.g. physical and cognitive decline, loneliness, dependency) (Angeletou, 2016). Hence such mediated services are predominantly based on stereotypical images of ‘being old’ that often goes beyond the actual lives and everyday practices of older adults. Furthermore they often inscribe ideals of active and healthy ageing in the technology, that correspond with contemporary neoliberal concepts of optimisation and self-responsibility (Suopajarvi, 2015, 2016).

Thus there is an articulated need to bring together city administrations as data owners, technology developers and older citizens as knowledgeable individuals and prospective users in order to co-create valuable public services based on open data in participatory design processes (Sieber & Johnson, 2015). The articulation of this need may be found in the publication of several funding lines (of e.g. the European Commission) in which research and innovation projects are proposed that co-create public digital services. Such an emphasis on

the citizens as co-creators of digital public services features also in current discourses about a shift towards “digital citizenship” (e.g. Isin & Ruppert, 2015). As far as we are aware, our project is the only one funded under H2020 that specifically targets older adults as co-creators of public services.

1.8.4 Conceptualising expertise in co-creation processes

The “sharing of expertise” was defined as one of the main objectives of participatory design. In particular, with respect to older adults, we have argued that in traditional software development projects they are often depicted in stereotypical images pointing to their deficits and limitations.

Establishing older adults turned out to be one of the most important motivators for their participation in our co-creation projects. In our Senior Citizen Engagement Reports (D3.2-D3.5) we have presented multiple accounts in which our participants express the importance of valuing their knowledge as a key success factor to our co-creation projects. In the following, we want to outline, how expertise may be understood in the context of co-creation projects.

Whereas expertise used to be understood as something logical, the understanding of it has moved towards ideas of expertise as something practical: “something based in what you can do rather than what you can calculate or learn” (Evans & Collins, 2008, p. 23). Polanyi (1966) who coined the term “tacit knowing” has contributed to this understanding. He conceptualised tacit knowing as something highly personal and difficult to communicate: It is embedded in the experiences of individuals (such as the knowledge on how to ride a bike or how to swim) and includes mental models and beliefs. These models and beliefs are often taken-for-granted assumptions about the world. Based on the idea of tacit knowing, Polanyi (1966) famously stated: “We can know more than we can tell” (p.4). Explicit knowledge, in contrast, is defined as articulable and objective; it can be codified, stored in databases and libraries, and ultimately circulate easily. The difference between tacit and explicit knowing may be summarised in the following quote: “The knowledge that I have of my own body differs altogether from the knowledge of its physiology” (Polanyi, 1966, p. 20). Yet, as Polanyi argued these two modes are not separate but constitutive of each other (e.g. my knowledge of the physiology of human bodies will shape the way in which I experience and know my own body and vice versa).

If the tacit knowing of future users is of interest in participatory design processes, in particular beyond the obvious and conscious needs or desires of users, then the question arises how the articulation of this knowledge may be facilitated. One answer may be found in Orlikowski’s (2006) account of “material knowing”. Similar to Polanyi who stressed the proximal character of tacit knowing, Orlikowski (2002, p. 249) argues that knowledge is not something static or a stable disposition, but something that is continuously produced and reproduced in everyday practice. A practice view on knowledge leads us to understand “knowing as *emergent* (arising from everyday activities and thus always ‘in the making’), *embodied* (as evident in such notions as tacit knowing and experiential learning), and *embedded* (grounded in the situated socio-historic contexts of our lives and work). And to this list I want to add another critical dimension, and that is that knowing is also always material” (Orlikowski, 2006, p. 460, emphasis in original).

Orlikowski (2006) argues that “everyday practices and the knowing generated as a result is deeply bound up in the material forms, artifacts, spaces, and infrastructures through which humans act” (ibid). In this study, we argue that the materiality of probes allows participants

to act with them and in so doing perform their knowing. In the same vein Bjögvinsson et al. (2012, p. 105) suggest that one way to think about participatory design is to understand design artefacts, such as mock-ups or prototypes as boundary objects binding different stakeholders together. Star and Griesemer (1989) originally described four types of boundary objects which Gasson (2005) discusses with respect to software development projects:

- *Repositories*, such as libraries, which allow differences in the unit of analysis used by different groups. Star (2010) suggests that repositories come “from the need for an assembly of things that are conceived iteratively” (p.603). Heterogeneity of the things assembled can be maintained without becoming confrontational. The advantage of a repository is its modularity.
- *Standardised forms*, methods and procedures, which enforce normative work practices across knowledge boundaries and provide a shared format for solving problems. As such, these objects circulate easily and provide a standardised way of collecting information.
- *Models or ideal types*, which provide an abstraction that works for all knowledge domains. It can be a diagram or other description which does not accurately describe any details about any one locality or thing but which is adaptable across sites because of its vagueness. It can hence facilitate communication and cooperation across different sites.
- *Coincident boundaries*, such as a district or country, which provide a common boundary of analysis while permitting different internal contents. “The result is that work in different sites and with different perspectives can be conducted autonomously while cooperating parties share a common referent” (p.411).

Star (2010, p. 603) later refined the concept stating that an object is not just a thing but that its materiality is derived from action. Objects in her concept are “a set of work arrangements that are at once material and processual” (p.604). Interpretive flexibility grants objects the ability to overcome boundaries, to become “boundary objects”. These objects are viewed differently, for example by different professions allowing them to communicate. Hence “these common objects form the boundaries between groups through flexibility and shared structure” (Star, 2010, p. 603). The term boundary is not meant to divide between two groups but rather signifies the shared space in which they meet. They form boundaries between groups through flexibility and shared structure.

Star’s and Griesemer’s interest in boundary objects was on the ways in which they enable collaboration between different actor groups. In the knowledge management literature, scholars were more interested in whether and how knowledge may be shared across different groups of experts or communities of practice. For example, one of the big challenges in any software development project is the coordination of expertise. In this respect it is important to consider the aggregation and coordination of individual expertise (Faraj & Sproull, 2000, p. 1555). Boland and Tenkasi (1995, p. 356) suggest that boundary objects facilitate processes of “perspective making” and “perspective taking”. Perspective making describes a process in which a community specifies and refines its knowledge domains and related practices. Through this process, they are able to collate and align their perspectives and thereby develop common meaning structures (ibid). Boland and Tenkasi describe perspective making as a social practice, often based on narratives of experience and grounded in reflexivity. Ultimately, perspective making leads to some form of representation which explicates the knowledge (e.g. in form of boundary objects).

Perspective taking, in turn, starts with an understanding of what others know and requires an interpretive reading of the accounts that others have given.

For perspective taking we need a shift in emphasis, to focus on the individual's ability to make his or her own understanding visible for self-reflection. Once a visible representation of an individual's knowledge is made available for analysis and communication, it becomes a boundary object and provides a basis for perspective taking (Boland & Tenkasi, 1995, p. 362).

One example that Boland and Tenkasi provide is that of a map: a cause map depicting a physician's understanding of quality in medical care. By drawing the map, the physician makes his or her perspective visible (possibly even for him or herself). The map can then be exchanged with other physicians in different departments of the hospital. As such, this map (or boundary object) allows for perspective taking across different communities of knowing (p.362). Below is a figure from Boland and Tenkasi (1995) that explains their concept of perspective making and perspective taking.

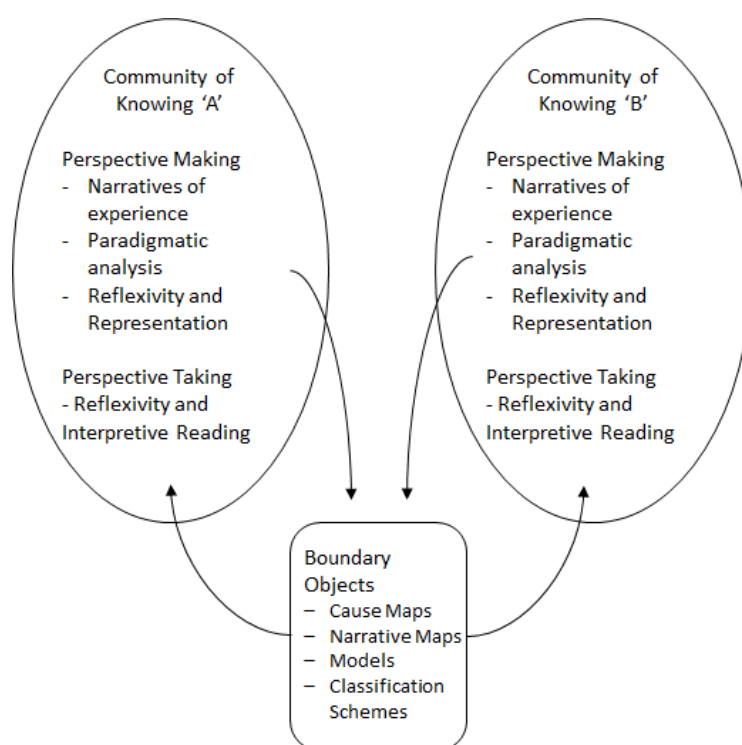


Figure 13: Perspective Making and Perspective Taking (Boland and Tenkasi, 1995).

In Mobile Age we have used and amended a number of methods to allow us the facilitation of perspective taking and perspective making amongst the older participants as well as between older participants and the Mobile Age teams. These methods include for example the probes as employed in Bremen and South Lakeland or the walking workshops as conducted in Bremen and Zaragoza as will be presented in more detail in chapter 4.

2 Methodology of our own action research practice

2.1 Co-creation as reflective practice of service development

We understand co-creation and our own activities as practice, by which we mean a set of purposeful activities in which one can become more accomplished or skilful through learning. Thus, practitioners become more skilful at what they do if learning is inherently part of how they do what they do. To learn from their own practices, practitioners need to engage with their own practices—co-creation activities in our case—**reflectively**. The pragmatist philosopher John Dewey suggested that “we do not learn from experience...we learn from reflecting on experience.” By this he means that we must not just do things (like following a recipe) we must rather attend (take note of) our own doing, as we do it, in order to understand the consequences of our actions so that we can modify them appropriately, as and when needed. Somebody that reflects on their own practice—and thus, learns from it—is called a reflective practitioner.

We have followed an action-learning model (described below) in all our co-creation activities or interventions.

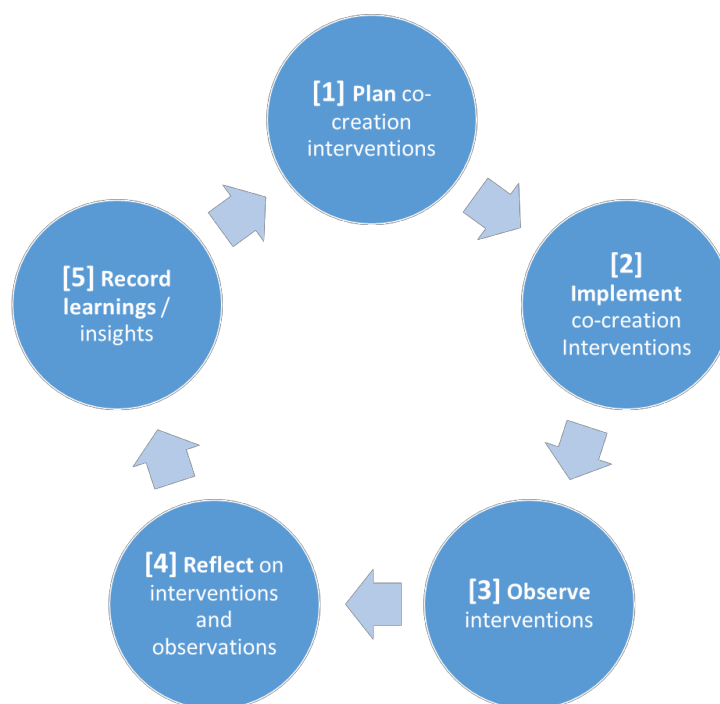


Figure 14: Action-learning model for co-creation

Step 1: Plan co-creation interventions. It is important to have a very clear idea of what you want to achieve with every intervention—for example, when you set up a project group or undertake a workshop. It might be useful to discuss the event with the project group (and other stakeholders, if possible) and compile notes for you to be able to recall at some later date.

Step 2: Implement co-creation interventions. Be careful to implement your plan but also stay open for the possibility of having to adapt it as new information and insights emerge during the co-creation intervention, as it is being implemented. A key element of reflective practice is to stay open, observe, and adapt when appropriate.

Step 3: Observe interventions. Observation is the key to learning. In order to learn we need to attend carefully to what is happening when we conduct co-creation activities. For example, when we do a workshop we should not only do all the activities, but also should try and capture what is happening, and try and imagine why some things are working, and others not. Why is this particular group working well together and another is not? If it is obvious, correct the situation, if possible and make note of it. Thus, as we do these activities we continually calibrate them for our own situation, whilst using the guidelines and tips to support such calibration.

Step 4: Reflect on interventions and observations. This step can take place whilst the intervention is being implemented (as suggested above) and afterwards. It is important afterwards to spend some time to consider the process and outcomes of the intervention, especially in terms of what worked and what did not work. This reflection can be individual but it is better to do it as a project group. It would also be very valuable to include all stakeholders in such reflections. What worked? What did not work? Why did it not work? What should we do differently?

Step 5: Record learnings and insights. Be sure to carefully record all learnings and insights. Both those that emerged during the implementation of the co-creation intervention (what we call “reflection in action”), and those that emerged afterwards when you reflected on the intervention (“reflection after action”). In Mobile Age we used a set of template to record and reflect on our co-creation activities. This helped to adjust our subsequent interventions.

2.2 Learning and Reflecting in Mobile Age

Each of the field sites used a reflective learning journal for documenting their co-creation activities. All were captured in our co-creation platform. In addition, we conducted a number of joint reflection workshops and visited each other for field trips. For example, we conducted planning workshops in Zaragoza and Thessaloniki as well as a field trip to Zaragoza. Several Mobile Age partners attended the field trip to Zaragoza and visited a senior citizen centre, undertook a walk with older adults and discussed their experiences.

In addition, we conducted bi-weekly calls as part of work package 3 in which all field sites reported on their progress, raised questions and discussed ideas. Finally, all field sites produced a Senior Citizen Engagement Report. Following-up on these reports, ifib conducted semi-structured interviews with all field sites.

Table 4: Joint learning and reflecting during Mobile Age

<i>What</i>	<i>Duration</i>	<i>Who</i>	<i>Why</i>	<i>Where</i>	<i>When</i>
Fieldsite working session during PMB meeting	0.5 days	all	Planning on collaboration and co-creation activities	Bremen	November 2016
Fieldsite workshop	2 x 0.5 days	BRE ZGZ	Preparation of co-creation activities	Zaragoza	February 2017
Fieldsite workshop	2 x 0.5 days	BRE RCM SL	Preparation of co-creation activities	Thessaloniki	March 2017
Fieldsite workshop before PMB meeting	0.5 day	BRE RCM ZGZ	Reflection on co-creation activities	Thessaloniki	July 2017
Fieldsite working session after PMB meeting	0.5 day	all	Planning of further collaboration	Thessaloniki	July 2017
Fieldsite visit	1 day	BRE RCM ZGZ	Learn about co-creation in Zaragoza, reflect on social innovation	Zaragoza	November 2017
Consultation on Engagement Reports; Interviews		all	Conducted by ifib with all field sites		May 2018

3 Mobile Age: Digital public services and open data use cases for an ageing population

3.1 Mobile Age rationale

One of the basic assumptions of Mobile Age is that if digital services are more relevant to older adults and more user-friendly, they may raise interest in and use of digital technologies amongst older adults (even those with little or no digital skills). The corresponding term in the digital agendas of the European Commission and countries such as the UK or Germany is “e-inclusion”. Thus social inclusion and e-inclusion are two mutually depending aims of the Mobile Age project and the co-creation processes. The success of the project therefore will be assessed by the effects achieved in both regards. Our study on accessibility, digital mobility and open data (D1.4) has taken a closer look at the age-related differences in internet use, the barriers older adults are facing and perceiving as well as measures that help overcoming these barriers. The main reason for political action in the field of e-inclusion is the risk of excluding those citizens that are not digitally literate and do not use digital media. In other words **e-exclusion will increase social exclusion**. There are many hypotheses about the reasons for the digital divide and barriers to e-inclusion (See D1.4 and Meymo & Nyström, n.d.). One relevant finding of gerontological research in our context identifies social capital as well as low self-efficacy as important factors for internet use as well as for the kind of internet services used. This is in line with our own research in Germany, which distinguishes between lower and higher barrier services or applications and their use depending on different degrees of self-efficacy (Kubicek & Lippa, 2017). In the US a study of more than 6,600 older adults aged 65 years and older found that several measures of social capital were positively associated with Internet use in general and that older adults who used the Internet for email/texting purposes only were the most socially and economically disadvantaged group of Internet users (Choi & DiNitto, 2013). The interesting point here is that social capital is relevant for social inclusion and for e-inclusion alike and has to be considered as an intervening variable in the relation between the two objectives of the Mobile Age project.

Below we provide an overview from our Interim Exploitation Plan (D5.5) that provides an overview on the rationale for co-creation processes. Such an overview is aligned with considerations stemming from the approach to co-production of services (chapter 1.4.1) and aiming at more efficient and effective service delivery.

Below we provide a more detailed account of the boxes in figure 15.

(1) Customer segments / future users senior citizens, families and mediators	(4) Solution (What) The kind of service, functionality content and technical implementation, e. g. Apps	(8) Unique value Proposition Expected additional value / benefits for senior citizens, mediators and other stakeholders compared to existing services	(10) Communication and engagement with customers Online and offline communication, support	(12) SWOT-analysis / Risk assessment SWOT = strengths and weaknesses, opportunities and threats
(2) Problem focus of customer group(s), i.e. limitations of existing services for different customer groups such accessibility, relevance of content	(5) Process (How) Main activities, co-creation methods, kind and degree of participation of end-users and mediators	(9) Output & outcome metrics Number and kind of users and kind of usage	(11) Sustainability Kind of lasting service provision, cost of maintenance	(13) Impact Long term effects for customer groups and other stakeholders, in particular governments
(3) Other relevant stakeholders in particular policy makers, local and regional governments	(6) Partners (Who) Organizers, senior citizens, mediators, developers,		(14) Revenues Payment from customers, subsidies from public funds et al.	
	(7) Input & Cost Manpower, data, cost of development process and estimate for follow up cost			

Figure 15: Adapted Business Modell Canvas (from D5.5 Mobile Age Interim Exploitation Plan)

3.1.1 Target audience/future users

As the aim of the Mobile Age co-creation projects are socio-technical innovations the problems that shall be solved by the Mobile Age products must solve certain kinds of problems of these users groups, which so far are not satisfactory to the respective users. The Mobile Age project takes a situated proactive approach. This means that problem definitions are not taken from an academic view but from the everyday practices of the customers, focusing on the present kind of action they take in order to reach certain aims and the problems they usually encounter in these situations. Particular focus is on the limitations of existing services. For the local public services developed in Mobile Age, the deficits and shortcomings of existing services for each customer group have to be assessed in the early co-creation activities. Besides senior citizens themselves family members, different kinds of caretakers and other mediators involved in elderly care and social work should be consulted in the problem definition as well.

The same building blocks apply for the developers' platform and the co-creation platform. In these cases the customer groups are technical developers or organizers of co-creation processes and their problems with existing tools and services. However, we will not explain each building block for these three different products, but in this chapter rather concentrate on the social innovation in public services for older adults.

3.1.2 Output, Outcome and Sustainability

According to the Mobile Age Evaluation and Impact Assessment Framework (D1.7), we define the service provided as result of the co-creation process as its "output" and the usage of the service as its "outcome" in quantitative and qualitative terms, i.e. number of users and immediate benefits. In the Mobile Age context two different phases have to be distinguished,

the project phase with the demonstrator or prototype and the after-project phase with a sustainable lasting public service. For both phases indicators (metrics) have to be defined.

In the project phase, these indicators have to be monitored. They provide indicators for estimates of the outcome in the after-project-phase. But it all depends on how a sustainable service provision can be achieved. Depending on who will offer the service in which context quite different outcomes are to be expected. For example, in Zaragoza the map-based service from the beginning was part of the local government's online service and will be continued without any interruption or modification. In contrast, in Bremen, the map-based district guide has been developed by the technical partner on their own server and after several months of pilot operation has now migrated into the city's portal with the same data, similar functionality and look, except for a different map. Output and outcome figures during the pilot phase cannot be used to estimate the cost to maintain a service after project phase.

3.1.3 Solution, Process, Partners and Input

The products that are subject of the exploitation plan must be described as solution to the problems outlined in the previous block. This may afford a rephrasing of the product description used in other deliverables, which address the professional or political audience: In which way does the product overcome the limitations of existing similar services? What is the added value? In which respect is the service for older adults a social innovation for these people themselves or the mediators?

A central argument in any case is that these services have been developed in a co-creation process together with older adults in the respective "customer segment" and therefore should be useful and usable by default. To support this argument, information should be provided about the phases and streams of the co-creation process and how many older adults have participated in which phase and which kind of mediators have been involved in the development of content and the technical development. In a prospective ex ante business plan the planned process and methods as well as the number and kind of co-creators should be outlined instead.

Three kinds of actors are necessary for the co-creation of a public service for senior citizens: The coordinator of the development process, software developers and older adults. The final provider of the service, i.e. local government or social welfare organisations may take the role of the coordinator. But in four of the five cases in the Mobile Age project it was the project team that took this role and now has to aim for a takeover by the respective local governments and for further exploitation by other local governments as well. In the Bremen case of the district guide it turned out that a number of local experts working in different areas for or with older adults have provided important input to the content of this service besides the co-creation core group. It is also recommended to look for other stakeholders that may support the sustainability of the service.

Concrete mapping of the main actors and partners and their role in the process is also relevant for the accounting and calculation of the cost of the co-creation process, in particular the manpower needed for recruiting and keeping participants on board and for content generation. Another important input element is (open) data. They may be available and be used and integrated easily. But in our cases more often data, which were relevant for implementing the planned problem solution were not available and had to be collected, edited and validated with additional manpower and cost.

3.1.4 The Unique Value Proposition

The unique value proposition is the heart of each business plan and the core element of any exploitation planning. Referring to the problem definition and the deficits of existing services the value proposition summarizes in a few precise sentences in which respect the planned solution will solve the problem and in which respect it is better than any existing solution, i.e. which additional value compared to competing services it will offer to different customer groups and in which respect it is a social innovation. In most cases one service may provide benefits not only to older adults, but also relieve family members or caretakers and/or save cost of service provision by local government or social welfare organisations. Therefore, it is important that for each customer group a value proposition is defined. If this is not possible, the respective group should not be considered as customers, but as other stakeholders.

As such, digital information services (as co-created in Mobile Age) offer a number of advantages compared to printed information, which is usually dispersed across locations and people.

- **Content can be provided in different levels of detail:** short teasers can be linked to more extensive versions and even single terms via links can be explained in detail via links (Hypermedia).
- Text can easily be **combined with pictures and videos** (Multimedia).
- Web Sites and documents can be **linked with websites** from other providers without any contractual relation (Hyperlinks).
- Even **long texts are better searchable by keywords** compared to index lists in books (Searchability).
- Online documents **can be found well** by using search engines and thus become accessible to a larger audience (Findability).
- **Updating is much cheaper** than printing new editions of flyers or leaflets.
- Content can be provided in **accessible formats to people with impairments** (e.g. visual or audio).

However, the advantages of e.g. searchability and findability at the same time proof disadvantageous as they require particular mental skills and digital literacy compared to using print media. And of course there is a need for technical devices and infrastructure which require additional technical skills and investment (for more on accessibility see D1.4).

3.1.5 Expected Impact

The usage of the new digital public service is an important aim in itself but in the context of public services at the same time a means to achieve more general social policy objectives, such as social inclusion or participation, reducing loneliness or to improve the medical care for low income older adults. These kind of social welfare impacts are hard to assess but an important argument for local governments to invest in the development or improvement respective digital services. At this point of time the impact assessment methods to be applied for the four field sites are still under development. If hard data can be obtained at all, this would be far beyond the end of the project, as these impacts take some time to fully evolve. But it will be possible to collect estimates by different stakeholder involved in the respective field of elderly care and social work as well as local government.

3.2 Mobile Age target audience

At the start of the Mobile Age project the target audience had been defined as older adults (> 60). Without any doubt, older adults in many aspects differ from other age groups. However, older adults are not a homogeneous group. Rather, there are big differences with regard to the personal resources (as mentioned above, i.e. social and cultural capital, financial resources and health), aspirations and abilities.

A broad distinction can be made between the Third and the Fourth Age (Laslett, 1987, 1991). In contrast to common stereotypes about old age associated with diminishing capabilities and deficits, Laslett established a positive ageing theory by calling this part of life the Fourth Age (characterised by the decline in mental and physical functions, ending in final dependence, decrepitude, and death). In contrast, persons in their Third Age (usually starting with retirement) are still relatively healthy and have time to follow their hobbies, social activities and even for learning.

A digital application on its own cannot solve any social problems. Rather, a digital information service can only complement and inform about existing (neighbourhood) resources and/or support local service providers in their service provision. **Hence, the target audience of a digital information service, will mainly include those older adults which are also targeted by the resources it provides information about.**

However, even people that are socially not well included and people in their Fourth Age can benefit from neighbourhood-related digital information services when certain types of **intermediaries** are considered as well. For example, neighbourhood managers, as well as community managers and providers of consulting services can use such digital information services in the communication with older adults with special needs and in search for support and thereby improve their social inclusion.

In addition, the digital information service shall not only address those older adults that are already online, but also serve as an incentive for others to acquire digital skills in order to increase their participation in the neighbourhood and get more socially included.

3.3 Problem focus: Digital Public Services for age-friendly cities and communities

Regarding our aim to improve digital public services for senior citizens, we need to address two questions:

- 1) What kind of online services and applications do older adults use so far and which services are of interest to senior offliners?
- 2) What services do local governments have to provide to older citizens?

In the following, we will attend to the questions from the perspective of older adults (1) and public authorities (2). The **first question** is addressed in detail in deliverable D1.4 Study on Accessibility, Mobility and Open Data. Here we like to mention a study on older adults ((age 60+) in Switzerland, that not only deals with the kinds of applications older people are using but also provide data in which applications offliners (people who have not yet used the internet) as well as onliners are interested in. The results show where there is still potential to motivate older people to use the internet (Table 5).

After email, used by 85 percent, the most frequent use is timetables of public transport (70 percent), followed by government information (69 percent), travel information (67 percent) and navigation (66 %) (Seifert & Schelling, 2015, p. 41). This shows that senior citizens in particular use information that supports their mobility, locally via timetables and maps und long distance with regard to traveling. The study also underlines the reluctance amongst older adults to social media.

	<i>% used</i>	<i>% interesting for onliners</i>	<i>% interesting for offliners</i>
Email	85	89	40
Time tables (Public Transport)	70	82	40
Government Information	69	82	42
Travel information	67	82	34
Navigation (Maps and Routing)	66	78	25
Health related information	61	76	42
Social networks	14	26	5
Internet Fora	7	12	12

Table 5: Actual use and interest in applications among older adults

Source: (Seifert & Schelling, 2015, p. 41)

Interesting is also the seemingly contradictory result of the study, that a number of respondents state, that they are interested in the applications listed but are not using them. This gap is very small for e-mail but about 10 % for all the other applications listed in the table. The challenge lies with the “off-liners”, who quite often assume that there are no benefits for them in using the internet. However, when asked about different applications 40 % find e-mail and timetables interesting, and 42 % health information. The low percentage of interest in navigation and social networks by offliners may be due to the fact that they cannot imagine what these look like and what their added value may be as there is no equivalent in the offline world. If older adults are provided with a tablet, they can experience such services and may find them beneficial.

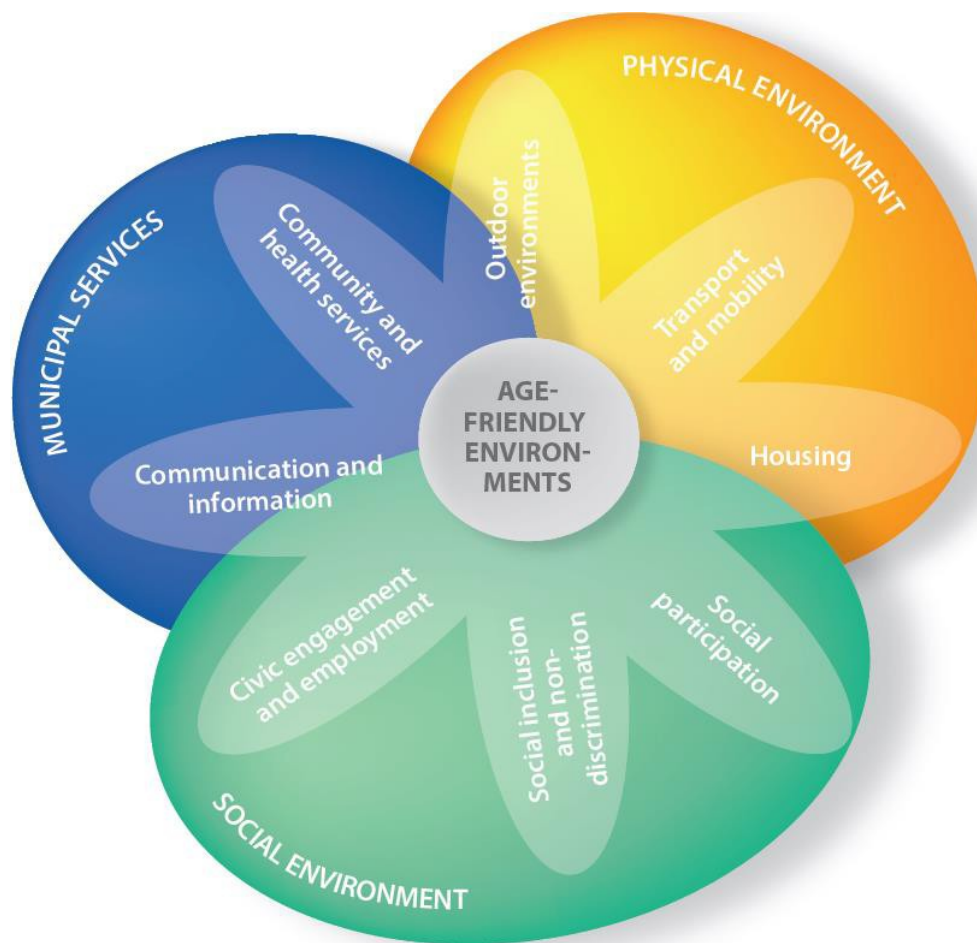


Figure 16: WHO Age-friendly cities guidelines (WHO 2017)

In order to attend to the second question and identify **relevant issues and domains for the application of digital public services for senior citizens** we can draw on policy recommendations from organisations like the World Health Organization (WHO), OECD, Covenant on Demographic Change that have identified requirements/needs for age-friendly cities and communities. According to the WHO, a more supportive and enabling social and physical environment is essential for people to age in better conditions. The WHO Age-friendly Cities approach proposes a framework of eight interconnected domains, as shown in **Figure x**, that can help to identify and address barriers to the well-being and participation of older people: built environment and outdoor spaces; housing; transportation; social participation; respect and social inclusion; civic participation and employment; communication and information; and community support and health services.

Within Mobile Age, we focused in particular on “participation and social inclusion” (Bremen), “safe and accessible city for older citizens” (Zaragoza), “community support and health services” (Thessaloniki), and “loneliness and social isolation” (South Lakeland).

In the following, we present the use case scenarios in an overview table and then describe the problem focus of each of the field sites in more detail.

Table 6: Problem focus of each field site

Use Case ID	Social Inclusion	Extending Independent Living with focus on loneliness and social isolation	A safe and accessible city for older people	Personal Health Information
Mobile Services	Map-based social networking and mobile open information services	Information service accessed through apps empowering older people to participate in activities and increase awareness of existing local activities and services by displaying combined and filtered information from different open data sources.	Map-based data curation and collaborative map creation	Health-related open data information services for senior citizens
WHO Domains	Communication and information Social participation Respect and social inclusion	Communication and information Social participation Respect and social inclusion	Communication and information Outdoor spaces and buildings	Community support and health services
Dataset domains (excerpt)	<ul style="list-style-type: none"> - Health service - Social security - Day-to-day activities - Leisure & culture - Living 	Public transport Weather Directions and reachability Amenities, facilities and points of interest Map location search (geocoding) Local events Local volunteering opportunities - Local services	<ul style="list-style-type: none"> - City equipment - Streets - Agenda - Suggestions and Complaints - Open311 	<ul style="list-style-type: none"> - Health Data - Transportation Data - Environmental Data
Pilot Sites	Bremen, Germany	South Lakeland, UK	Zaragoza, Spain	Thessaloniki, Greece

3.3.1 Bremen: Social inclusion and the importance of neighbourhoods

Social inclusion is a societal (or political) goal that aims to enable any person—no matter what age—to participate in the social, political, economic and cultural life (Naegle, Olbermann, & Kuhlmann, 2016). It hence links to the promotion of citizens' empowerment and participations (as individuals, as groups or communities). Factors that may hinder the

social inclusion of people or even areas are “combination of linked problems such as unemployment, poor skills, low incomes, poor housing, high crime, poor health and family breakdown” (Lyons & Huegler, 2013).

While there are several policy-related measures on the macro-level that aim to achieve social inclusion (e.g. social policies, labour market reforms), the focus of Mobile Age is on the meso- (neighbourhoods & districts) and micro-level (individual & families).

On an **individual level**, social inclusion may be understood as participation in (Naegele et al., 2016, p. 45):

- **economic** (participation in work life, sufficient financial funds and right to make decisions)
- **political** (participation, civic engagement, possibility for decision making)
- **cultural** (access to cultural life and related education)
- **social** (informal and personal integration in primary networks such as family, friends and social activities in society)
- **socio spatial** (relationship and bond with respective living environment: happiness, identity, bonding)

The British ELSA report proposes the term “social detachment” to measure the disadvantage on three of six indicators of social participation (contacts with other people, social support, civic/political involvement, participation in culture, participation in recreational activities/hobbies and participation in leisure) (Banks, Breeze, Lessof, & Nazroo, 2008; Tomaszewski & Barnes, n.d.). In this perspective, improving social inclusion is meant to be achieved by strengthening social capital and circumventing social detachment through appropriate neighbourhood development. The neighbourhood not only affects such outcomes as education, employment and health (Atkinson & Kintrea, 2000), but also the opportunities for building social capital.

Enabling older adults to remain in their communities and neighbourhoods allows them

- to connect and interact with other locals and to be part of a “safety net of people who ‘look out for you and would come if something was wrong”,
- “knowing where specific resources (e.g. health services and shops) are and how they work.” (Wiles, Leibing, Guberman, Reeve, & Allen, 2012)

The study conducted by Wiles et al. characterises “ageing in place” by the positive perceptions of older adults as a sense of attachment and social connection, a sense of security and familiarity and a sense of identity, linked to independence and autonomy.

In order to support ageing in place, the WHO has proposed a framework for **age-friendly cities and communities** with eight fields of action. In this framework, social inclusion becomes an issue of neighbourhood development in terms of **public infrastructure**, the **availability and quality of local institutions and services** in each of these fields. To assist older adults to remain in their communities and neighbourhoods with some level of independence, rather than in residential care homes, requires to consider not only their immediate housing options but also “transportation, recreational opportunities, and amenities that facilitate physical activity, social interaction, cultural engagement, and ongoing education” (Wiles et al., 2012).

Hence, **neighbourhoods** play a central role for social inclusion as social exclusion is often concentrated in certain neighbourhoods of a city or region (Ellen & Turner, 1997; Pickett & Pearl, 2001). Some European governments (e.g. Germany, UK) fund so-called **neighbourhood**

managers (described as intermediaries above) in deprived communities who among other things collect:

- Evidence of residents' identified needs and priorities
- Evidence of the quality, level and performance of local public services and any gaps in provision or issues with performance

They are also called “pathfinders”, as one of their functions is to give evidence-based recommendations to local government which services in their neighbourhoods are missing or are of poor quality in order to improve social cohesion and combat poverty. A British evaluation report found that from the experience of neighbourhood management pathfinders it has become clear “that baseline information at neighbourhood level is not always available, or not very accessible” and “improving information about levels of service and service expenditure at neighbourhood level continues to be a challenge.”

Social inclusion in this context is the result of the interplay between the resources of a neighbourhood and the resources of older people living there. People with low social and cultural capital, little financial resources and poor health will use the local resources to a lesser degree and are socially less included. If there is a lack of services and facilities in a neighbourhood even a high degree of personal resources does not lead to high a degree of social inclusion.

Appropriate information about the available resources in a neighbourhood can have a positive effect on social inclusion, if it meets the media habits and abilities of the target audience.

3.3.2 Zaragoza: Safe and accessible city for older citizens

In Zaragoza, the problem **focus is on a safe and accessible city for older citizens in correspondence with WHO age-friendly cities and communities framework.** The first co-creation process produced a service (collaborative maps), that improves the age-friendliness of neighbourhoods via age-friendly routes and requires access to the internet or mobile devices. The second co-creation process produced a website on the municipal website that is usable and accessible by older adults and contains all the information they need. The rationale for Zaragoza's problem focus is very much linked to the idea of “ageing in place” and the importance of a neighbourhood as described for Bremen. They are also linked to Zaragoza's strategic policy objectives of becoming a WHO age-friendly city.

On March 27, 2009, the City Council unanimously approved the integration of Zaragoza into the WHO Global Age Friendly Cities Network. In March 2011, the accession to the Network was formalised, with Zaragoza being the second Spanish city to be integrated. In accordance with the commitments acquired, the first phase of work, a participatory diagnosis analysing the different areas of research established in the Vancouver Protocol was carried out using the methodology established (Investigation-Participation-Action).

This diagnosis (or baseline report) had to include two types of investigation: quantitative and qualitative research on the city and taking into account 8 different areas. So, on the one hand, we had information on every aspect of the city affecting an older person, and on the other, focus groups were organized in order to find out their opinion on all that information.

The mechanisms and areas of participation of senior citizens in the diagnosis process were defined in order to develop a diagnosis that would allow to measure the friendliness of the city with older people involving the participants in the analysis process and improvement

proposals regarding programs, services and characteristics of the city for the elderly and to generate a series of proposals that would allow a plan of action adapted to the needs and demands of older citizens in the city.

The development of the first phase of action generated the diagnostic document of the city, which not only evaluated the friendliness of the same, but analysed in each of the areas defined in the Vancouver Protocol the strengths and weaknesses in the opinion of the seniors, in addition to proposing improvement actions.

This information allowed the production of 25 proposals, with different levels of concretion, that together with the methodology proposed in the document itself, are the summary of the opinion of older citizens as well as the starting point for the elaboration of the Action Plan.

One of the projects in this Action Plan is "Walk and discover a safe and accessible city", counting with groups of seniors who detect needs in the field of security and accessibility in order to achieve a city increasingly friendly with this group. Therefore, they proposed the creation of "friendly routes" with the elderly, routes that later were digitalised and can be accessed through the City Council's web page.

We can define a **friendly route** as the one that:

- Is a useful and frequent route: it is an habitual route that older people use in their daily life in the neighbourhood. The Senior Centre of the district will be taken as reference point.
- You can walk in a safe and accessible way. This implies that older people will have previously studied the existence or not of a series of important needs for this group.
- It is developed through the participation and consensus of a team of older people.

3.3.3 South Lakeland: Loneliness and social isolation

In South Lakeland (SL)—which is largely a rural community—the specific **focus of the Mobile Age Project was on loneliness and social isolation**. This specific focus was co-created with stakeholders since it emerged from our engagement with a broad range of stakeholders. Our initial broad focus, as outlined in the grant proposal, was independent living. However, as we explored the issues pertaining to independent living, the NGOs and the District Government claimed that independent living would be extended if we could provide an intervention that addressed loneliness and social isolation in this rural setting. Broadly defined, we see loneliness as referring to the perception by older adults that there are no significant others involved in their lives, while social isolation refers to the limited quantity and quality of social networks available to an individual (Gierveld, van Tilburg, & Dykstra, 2006). They are of course mutually reinforcing. Addressing loneliness and social isolation is seen to lead to significant socio-economic benefits such as reducing the number of healthcare visits and allowing older adults to live independently in their own homes for longer (Findlay, 2003; Gierveld et al., 2006; Steptoe, Shankar, Demakakos, & Wardle, 2013). Dealing with social isolation and loneliness is a complex and multi-dimensional problem for which there are no simple solutions (Gierveld et al., 2006). Nevertheless, enabling connections in order to facilitate the development of significant social relations emerged as an important issue. Enabling connections involved simultaneously addressing a number of key indicators in the Age-friendly Environments in Europe framework (Figure 16) (WHO, 2017) such as:

- **Social environment:** Social participation, and Social inclusion & non-discrimination
- **Physical environment:** Transport and mobility

- **Municipal Services:** Communication and information

How these indicators are addressed through the Mobile Age Social Connectedness in South Lakeland:

Social Participation: *action area 'Range of opportunities for social participation that are accessible for older people':*

The Mobile Age Social Connectedness apps provide information on events and how to access them for older adults. It also provide the services hosting the digital service with analytics that could help improve the planning of new events and access services such as transport and support.

Social inclusion and non-discrimination: *action area 'social exclusion':*

The Social Connectedness app aims to help prevent loneliness and social isolation by providing information on social participation. This includes events, how to get to events and listing available services and volunteering opportunities

Civic engagement & employment: *action area 'engagement in public life: co-creation and volunteering':*

The apps provide information about opportunities for older adults to volunteer. The research project provided the opportunity for a group of older adults to be involved in the co-creation process. Feedback from this group showed that there would be interested in taking part in other co-creation processes in the future.

Transport & mobility: *action area 'on-demand specialized transport services and other support to improve mobility':*

The project included many discussions around the provision of technological solutions. For example, we examined how we could incorporate a function where users could request and offer rides to other users of the app. We were prevented by issues of safety and the logistics of implementing such a service, which go beyond a simple technical solutions. For example, drivers would have to be vetted. However if a ride-sharing scheme was to be established in the region in the future it could possibly be incorporated to the app.

The app displays pre-travel information that shows transport options and times. This information can be accessed by intermediaries providing support to older adults to help with travel planning even if the older adults do not have digital access.

Communication and Information: *action area 'Age-friendly information' and 'digital gaps':*

The apps provide local information that can be tailored to the preferences of individual users through the combination of search and user profiles. The interface was developed to comply with W3C accessibility standards. It provides information from open data sources on events, services and volunteering specifically tailored to older adults. The apps can be used directly by older adults with access to digital devices, but it can also be used as a tool by cares to access information and pass it on to older adults that they support.

In addressing these key indicators, we focussed on **participation in the social environment** by:

- Creating supportive environments for social exchange and providing opportunities for social contact in the community. More specifically, **empowering older people to participate in activities & increase awareness of existing activities by using existing open data infrastructures more effectively.**

Older adults want to participate in meaningful social interaction—through locally organised social events and activities—both as participants and as volunteers. However, such participation is made difficult as a result of a number of dimensions:

- **Information about events** and activities are fragmented across many service providers who have multiple, often exclusive channels of communication - some paper based and located, some digital but not readily accessible.
- **Transport** to and from the events or activities is not readily available in the timeframe required. This is exacerbated by cuts to transport budgets in rural areas.
- Other **environmental information** such as weather, physical accessibility, toilets and so on is not readily available.

In sum: the **cognitive and logistical burden** of finding organised social activities and organising the resources (such as transport, cost, suitable clothing etc.) to attend these events are so high that it is extremely difficult for older adults to participate. Thus, non-participation becomes the default and participation becomes exceptional. This inability to connect leads to social isolation and loneliness. This makes future participation less likely - in a self-fulfilling cycle. The co-creation process focused on creating a social connectedness application (or applications) in a secure and trusted environment.

Central to any IT solution are a number of key elements:

- The solution must be rooted in the everyday situated practices of older adults
- The solution must not detract from, but enhance **existing social interaction**
- Any technological solutions must provide them with a **safe and trusted** application that is stable and which they can rely on,
- Any technological solution must enable **intermediaries** to use it on behalf of older adults

3.3.4 Thessaloniki: Community support and health services

According to WHO (World Health Organization), an age-friendly city should provide policies, services, settings and infrastructure to enable people to age actively by:

- recognizing the wide range of capacities and resources among older people
- anticipating and responding flexibly to ageing-related needs and preferences
- respecting their decisions and lifestyle choices
- protecting those who are most vulnerable and
- promoting their inclusion in and contribution to all areas of community life.

In Thessaloniki, the government units involved were the health department and the IT department. Aligned with their competences and departmental objectives, they focused the co-creation activities on the health issues and problems of older adults, who are the most vulnerable part of the community, in search for the proper available health provider in an attempt to provide social support related to health services through communication and information using the internet.

3.4 Digital public services in Mobile Age

The problem focus and domains of interest in the Mobile Age project cover a variety of domains for age-friendly cities and communities as proposed by the World Health Organisation (WHO). Between the pilot sites, we had an overlap of topics. For example, Bremen and Zaragoza shared an interest in map-based services and the importance of local infrastructure for supporting ageing in place. South Lakeland shared an interest with Bremen in representing local resources in the digital mobile service (events vs. places).

Overall, the services developed in Mobile Age are all services relating to digital information and communication services (and not transaction or integration, see Fig. 17). Digital information service provide information about existing neighbourhood resources.

For engaging senior citizens to co-create a digital service that meets their needs and that offers gratifications to a larger group of older adults, **information about the resources in their immediate neighbourhood** has proven to be a good starting point.

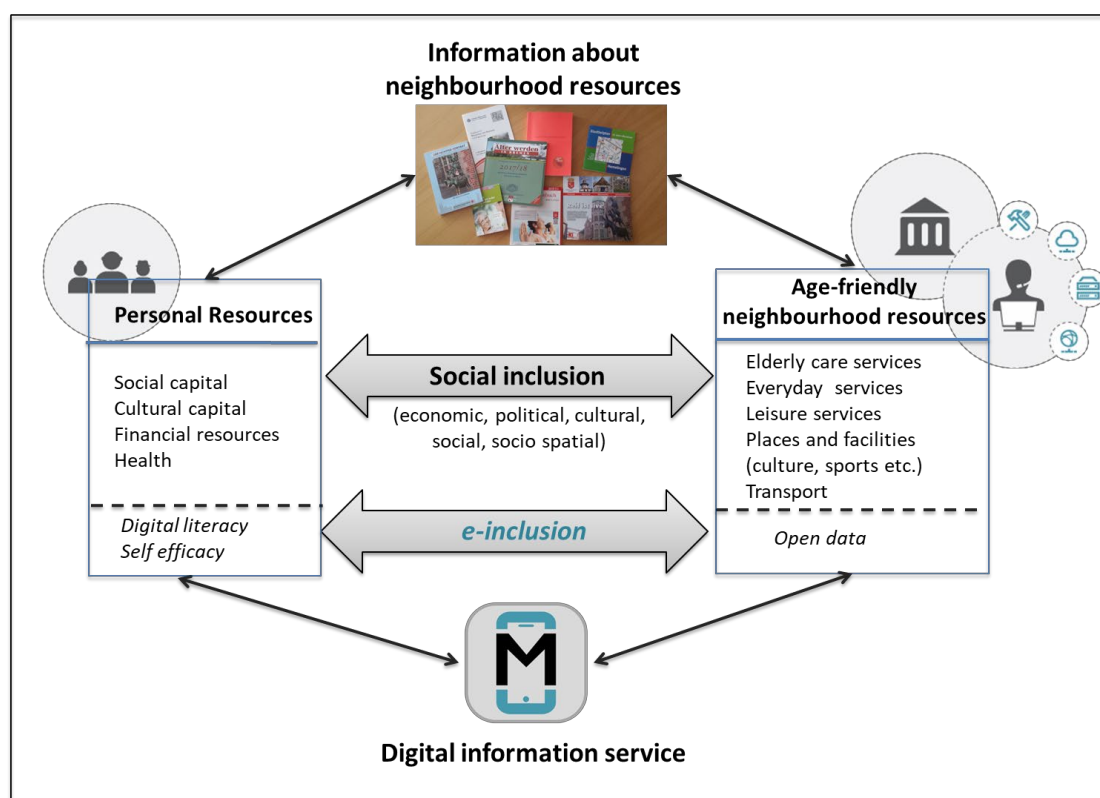


Figure 17: Co-creation of a digital information service as conducted in Bremen

Of course, it will not be possible to motivate all older adults to start using the internet. Therefore, digital information services cannot yet completely substitute printed information. For improving social inclusion it is still necessary to provide printed information of similar relevance and quality, ideally in a multi-channel approach that provides the same or at least similar content online and in print.

Except for Zaragoza, all Mobile Age field sites developed digital information services. The co-creation process as conducted in Zaragoza also allow for a communication service in that the citizens could propose changes to the built environment.

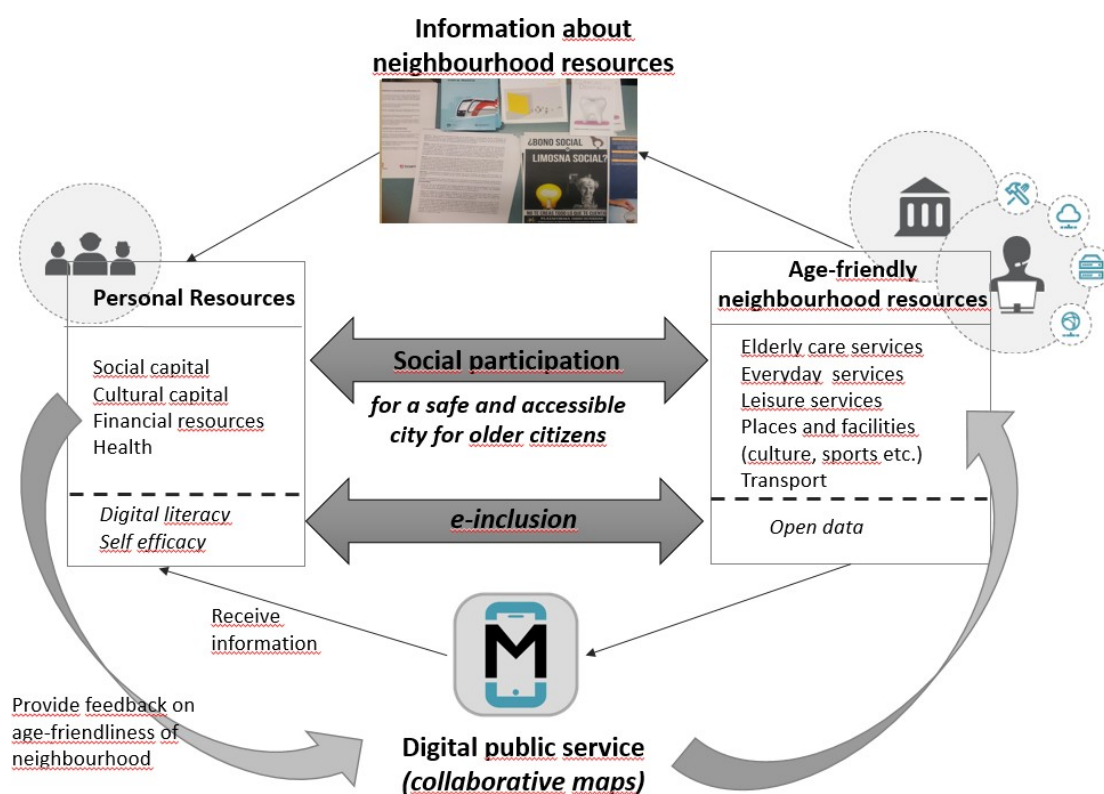


Figure 18: Co-creation of digital public service allowing information and communication as conducted in Zaragoza

4 Adopting methods for co-creation

4.1 Overview

4.2 Methods for co-producing, co-designing services and engaging with data

Stemming our review of approaches to co-creation, there is a manifold of different methods that may be used to implement co-creation processes. Below follows an overview of some of the most common ones. There are other projects which have compiled rich portfolios of for example, participatory design methods. We are hence aware that this is not comprehensive. We have distinguished between different streams of activity that are involved in such processes.



Figure 19: Potential methods per co-creation stream

That methods are not neutral but performative has long been argued in research fields such as Science and Technology Studies (STS) (Law, 2004; Mol, 2003, 2010). Any method assigns roles, establishes or deconstructs power relations, constructs users and use cases. One of the main challenges in the civic co-creation context has been a move from users as individuals being part of an organisation (e.g. in the context of technology design for work places) to citizens as users of digital public services (Gidlund, 2012). While it is difficult to involve all users within a particular organisation, it is close to impossible to involve all citizens.

To then create a useful set of fictive users or a useful number of representative users, we will have to extract a very large number of heterogeneous characteristics. Such an extraction, resting on what is considered as important characteristics in the specific situation, might run the risk of losing what really matters during the process because the information is mistakenly perceived as beyond the scope (Gidlund, 2012, p. 14).

An additional issue relates to the question whether everybody's insights are equally welcome or are there assumptions on whose ideas are more important. And who decides who should be listened at what stage of the process. What Gidlund argues is that we need to take contextual arrangements into account to also consider power asymmetries between actors (e.g. power relations between individual positions and power relations on a structural level). It is hence important to be conscious about and reflect on the choice of methods.

In our co-creation processes, we have used a range of different engagement methods. Well known are workshops and focus groups, discussions and meetings, prototyping and testing. We have also experimented with methods which are so far not well established in the co-creation of digital public services. For example, we have worked with "probes", a method that comes from design research and "data walkshops" a method developed in critical data studies and civic use of (open) data. As these two methods stand out from the more traditional ones and have been key to some of the processes we conducted, we will introduce them below in more detail. We will discuss the ways in which we have used some of these methods in Mobile Age in chapter 4.

In the following, we provide an overview about which methods we have used specifically for our engagement of older adults and other stakeholders and reflect on their suitability for co-creation process. Some of the questions that are important for reviewing how methods were adopted in our co-creation processes are:

1. How can older adults become co-creators? What roles may they assume and what methods may facilitate a role-shift from user to co-creator?
2. How can older adults assume the roles of experts in co-creation processes? What other roles may be suitable
3. How can older adults engage in civic open data use?

In the following, we provide an overview table of methods used in the five different co-creation processes. Subsequently we will reflect on the use of these methods and their adaptation for our purposes. We will give a more detailed account on some of the methods which have been important to our co-creation processes and which we developed further. These are in particular (highlighted in the table):

- Games (section 4.3)
- Activity sheets (section 4.4)
- Probes (sections 4.5)
- Personas (section 4.6)
- Data Walkshops (sections 4.7)
- Content creation workshops (section 4.8)
- Data Tables (section 4.9)
- Digital prototyping (section 4.10)
- Workshops (section 4.11)

Table 7: Methods per stream of co-creation activities per pilot study

Field site	Bremen Osterholz	Bremen Hemelingen	South Lakeland	Zaragoza	Thessaloniki
Planning	Desk research Stakeholder meetings	Stakeholder meetings	Desk research Stakeholder meeting workshops	Survey as part of WHO age- friendly city initiative	n/a
Engaging stakeholders and diffusion	Stakeholder interviews and meetings Information events Newspaper articles Social media Multi touch tables on fair Kick-off event Printed neighbourhood guide Presentations in senior citizen meeting places	Establishment of core project group District walks Presentations Newspaper articles Social media Kick-off event Printed neighbourhood guide Presentations in senior citizen meeting places	Stakeholder meetings Interviews Focus groups Observation and participation in local older adult events Plans for diffusion co-created with stakeholders, older adults and intermediaries Newspaper articles University community event	Meetings between government departments (IT & elderly care) Meetings with senior citizen centres Newspaper articles Local television	Stakeholder meetings Information events
Engaging stakeholders	Stakeholder interviews and meetings Information events	Establishment of core project group District walks Presentations	Stakeholder meetings Interviews Focus groups Observation and participation in local older adult events	Meetings between government departments (IT & elderly care) Meetings with senior citizen centres	Stakeholder meetings Information events

D1.5 Final study on co-creation practices

Co-Creating a service concept	Cultural Probes Interviews Paper card game Personas	Focus groups Probes Walking workshops	Interviews Focus groups Probes Workshops	Focus groups Walking Workshops	Questionnaires
Working with (open) data (defining, identifying, procurement and co-creation of data)	Focus groups Workshops on informational content Data tables	Walking workshops Content creation workshops	Stakeholders meetings Cultural probe	Data collection documents	n/a
Co-creating software	Scenarios & paper prototyping Test use via tablets Map design workshop Digital design workshops	Paper prototyping User testing/test walk	Workshops Probes User testing	n/a	Scenarios & paper prototyping Test use via tablets
Provision	Workshop in data maintenance	n/a	n/a	n/a	n/a

4.2.1 Interviews

Interviews were conducted in all field sites mostly with intermediaries, but also with older adults (e.g. in Bremen Osterholz). Interviews were very useful in understanding the main concerns and needs of the participants early in the co-creation process. Interviews also provided descriptions of participants' practices on using technology, services and attending social activities.

4.2.2 Informal chats

Informal chats are interviews that did not follow a pre-determined script with stakeholders such as older adults, service providers, local authorities and intermediaries. They helped us gain a greater understanding of the issues and context of the field site.

On reflection, in addition to the insight gained from their content, these informal chats were very important in-built rapport and strong relationship with participants and helped in many stages of the co-creation process, for example in engaging co-creators and in exploring avenues for collaboration and dissemination.

4.2.3 Taking part in older adult events (observations/ethnographical approach)

In South Lakeland, facilitators took part in events frequented by older adults at the beginning of the co-creation process. Those were opportunities to hold informal chats, but also to observe who was taking part, the details about the settings and how older adults interacted amongst themselves for the events. In phase two, this was used as a strategy to identify intermediaries that were volunteering/working with older adults and engage them in the research.

4.2.4 Focus groups

Focus group are facilitated discussions around a specific issue with a selected group of people. The interaction of the participants is important, and insight comes from the debates and negotiation on their views and opinions.

In all field sites, focus groups were conducted, either with older adults or with local stakeholders. Focus groups were a method that allowed us to gain a great amount of insight, especially when its findings were complemented and compared with individual interviews.

4.2.5 Group discussion

In exploratory group discussions, a theme is introduced and participants take the lead of the debate. Open discussions were often used in the co-creation workshops and were at first very helpful in identifying needs and priorities for older adults and allowed them to shape the proposition for the service concept and apps. However, when used later in the development of the apps, started to cause some discontent with the co-creators as some of them would go back to the same themes and arguments and slowed down progress.

4.2.6 Observation of task

Participants are given tasks and facilitators observe how they respond to or complete those tasks. Information is gained through their responses as well as their performance on the tasks.

For example in South Lakeland, this type of methods was used twice on the co-creation workshops. First when we asked the participants to perform searches using different websites and later when we asked them to test the one of the versions of the first working, but not yet complete, versions of the social connectedness apps.

4.2.7 Demonstrations of apps

Working versions of the apps were presented to participants and feedback was sought on. Participants were encouraged to comment on how the apps looked, their functions, how easy it was to use and find information. The same way as the prototypes had before, it provided a concrete basis for discussions and modifications to be made.

4.2.8 Survey and questionnaires

A series of questions to gather standardised data from participants. They can be paper based or available online (we have used both versions in our evaluation tasks). These methods are used generally to collect quantitative data and limited amounts of qualitative data. One of the shortcomings of this method when collecting qualitative data is the lack of possibility of follow up questions to elucidate any doubts about meaning. In our co-creation process, surveys and questionnaire were used in conjunction with discussions, interviews and focus groups.

Surveys were used in all field sites. As method, it was useful in collecting data such as demographics quickly during interventions, and leaving more time for focus on discussion more in-depth on other issues. However, in some cases the questionnaires were perceived as unreasonable task, in particular the provision of personal information was sometimes met with discontent by older participants.

4.3 Paper card game

To start the co-creation process in **Bremen Osterholz** we wanted to provide a notion of the project objective and what kind of input, in particular local knowledge we would like participants to contribute. As these expectations are difficult to communicate verbally, we decided to begin the process with something tangible: an activity that would be fun and attract interest in the project, so that people would be encouraged to come again. We choose to develop a card game in order to (i) learn about the district, (ii) facilitate the communication between participants and (iii) provide low-tech engagement.

At an *information event* participants were asked to fill out the gaps on the cards. In doing so, they not only shared their knowledge about the district (e.g. what is beautiful in Osterholz) but also considered questions that could be relevant to them or others in the district. For the *kick-off workshop* we had prepared a proper card game (with pictures) based on the participants' input. Their task at this workshop was to evaluate each other's input via blue and green points (for relevance) and leave remarks.



Figure 20: Card game as developed at information event 23/05/16



Figure 21: Card game as further refined and played at neighbourhood festival and kick-off workshop

For our process it was important to establish the co-creators as experts (of the process of ageing in the neighbourhood as well as related issues and possible solutions) and to appreciate their local knowledge. This established an engagement of mutual respect between the project team and participants, as both parties wanted to learn from the other.

The participants appreciated the refined version of the card game, as they could see that their work had been valuable and were actively engaged with the card game. To see pictures of their district and discuss them seemed to motivate them. The card game as method worked well to motivate the participants as the focus was laid on the district, not on technology.

4.4 Activity sheets, including lists and cards

Processes inspired by design research and creative exchange methodology described in resources such as IDEO Method Cards (<https://www.ideo.com/post/method-cards>) and the Leapfrog Project (<http://leapfrog.tools/tools/>) were employed in South Lakeland. Many of these methods are used together with group discussions and brainstorming.

In South Lakeland, the activity sheets, cards and lists we created for our workshops were: Theme cards, services and events lists, persona cards, journey to event worksheet, co-editors, Negative/Positive and icons brainstorming. The use of these materials was explained in the description of the workshops detailed in deliverable D3.3: Senior Citizen Engagement Report South Lakeland (The appendix section of that document contains examples of the resources developed in the South Lakeland field site).

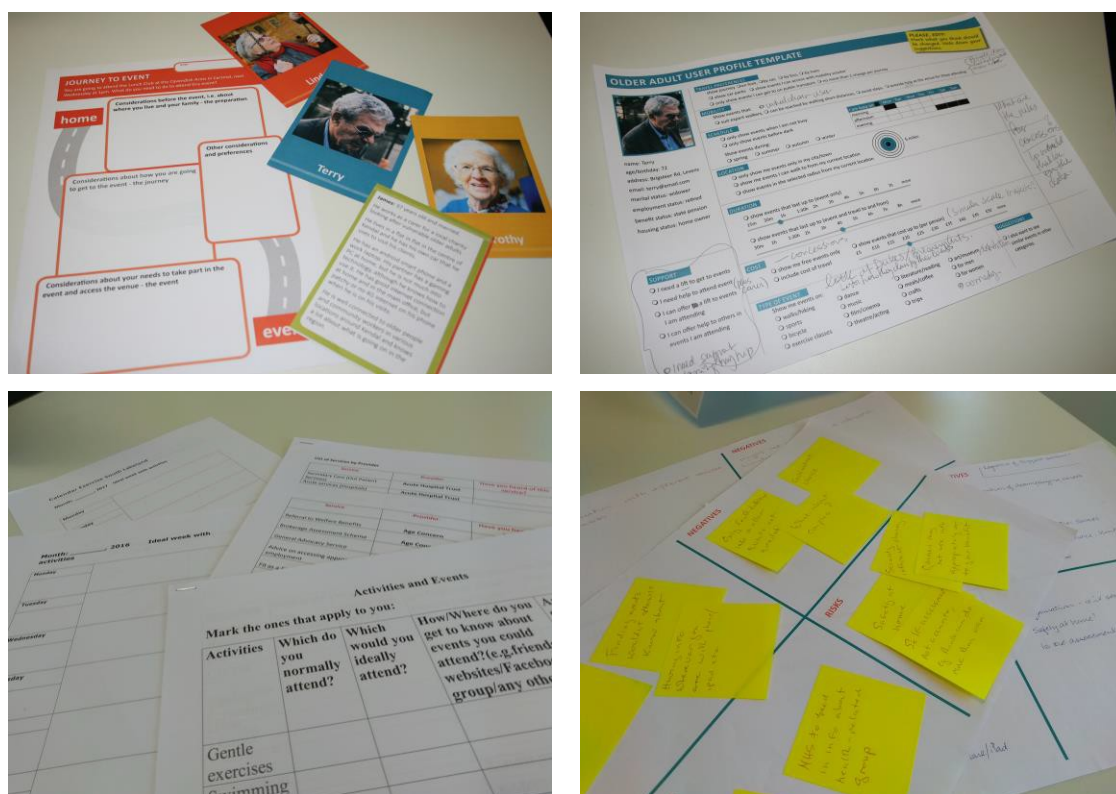


Figure 22: Examples of activity sheets, cards and lists used during the co-creation workshops in South Lakeland

These materials were very useful in the co-creation workshops in helping focus discussions. They also helped us exchange the information we had, for example on local services with the co-creators and learn from their expertise. One lesson learned was to plan carefully those materials, adjusting after feedback from the previous session to ensure we kept the activities interesting and stimulating and at a level that all could comprehend and participate.

4.5 Probes

Probes were originally conceived by a group of researchers/designers within an EU-funded project to engage with older adults (Gaver, Dunne, & Pacenti, 1999): The cultural probes – a pack of maps, postcards, a camera, a photo album and media diary – “were designed to provoke inspirational responses from elderly people in diverse communities” (p. 22). Gaver et al. conceived of them as something like astronomic or surgical probes, which are left behind when researchers leave and over time return fragmentary data. The probes were part of an experimental design, in which a group of researchers wanted to find new ways for developing projects for unfamiliar groups. “Understanding the local cultures was necessary so that our designs wouldn’t seem irrelevant or arrogant, but we didn’t want the groups to constrain our designs unduly by focusing on needs or desires they already understood” (p.22). In contrast to scientific probes, cultural probes were meant to be a source for inspiration, not information. It aimed to be surprising and creative.

In subsequent years, probes became widely adopted in human-centred and participatory design and were amended to include concepts such as “design probes” (Mattelmäki, 2006), “technology probes” (Hutchinson et al., 2003) or “mobile probes” (Hulkko, Mattelmäki, Virtanen, & Keinonen, 2004).

One way in which probes came to be appropriated was as a tool for data collection. Most studies, as Boehner et al (2007) point out in their review, adopt probes as part of their initial investigation for understanding a particular context. Often they are coupled with interviews and at times supplement ethnographic approaches. Some studies integrate probes in participatory design exercises; for example, discuss the results of probes with participants. In general, probes are either used to understand current use situations or to get ideas on new applications.

Some studies take the participatory aspects of probes further and insist that participants should also be involved in the translation of the probes into design ideas (Boehner et al., 2007, p. 1079). Others see probes as a possibility to allow participants to reflect on their own practices and to express these reflections (Boehner et al., 2007; Vetere, Davis, Gibbs, Francis, & Howard, 2006, p. 1477). Participants decide and control what information they record and share, and in so doing secure their privacy.

Importantly, probes are not an alternative formal or objective method for simply “getting data” but rather “frame an alternative account of knowledge production in HCI design” (Boehner et al., 2007, p. 1078). In their review of how HCI researchers have appropriated probes, Boehner et al. (2007) suggest that there has been a shift in the definition and interpretation of probes from response to representation: “from seeing interpretation as a researcher *responding to what was expressed by the researched* to seeing interpretation as a researcher *ascertaining facts about the research*” (p. 1082, emphasis in original). The idea of *interpretation as response* understands the process as dialogical in the sense that researchers articulate their research questions and instruments, which are interpreted by the participants. The participants in turn respond by expressing their interpretations; researchers respond by expressing their interpretations through potential design ideas. There is never an attempt to “fix the true meaning of any particular response”. In contrast, the idea of *interpretation as representation* aims to “fix the true meaning of what users said, who they are, what they do, and what they need” (p.1083). Boehner et al. (2007) argue that “a major focus of probes’ uptake in HCI has been to use probe returns to develop objective, factual descriptions of user needs” (ibid).

In Mobile Age we used Probes in two field sites: South Lakeland and Bremen. The use of probes in both field sites differed and will be detailed in the following sections:.

4.5.1 Probes in Bremen Osterholz: a tool for sharing tacit knowing⁶

4.5.1.1 Introduction

The use of probes in **Bremen Osterholz** allowed to investigate a different understanding of the role of interpretation when using probes in participatory design processes: Probes as boundary objects that enable/facilitate the articulation of users’ tacit knowing and the shared interpretation of their accounts. Others have pointed to the ability of probes to act as “boundary objects” (e.g. Bjögvinnsson et al., 2012; Ehn, 2008). What is of particular interest is the focus on collaboration and knowledge sharing across social worlds. For the purpose of this study, we are interested to explore further what this means for the negotiation of expertise, as coordination device between researchers and participants and as a way to articulate tacit knowing and make it accessible to others.

⁶This section is part of a paper published by Jarke & Gerhard (2018) as part of a special issue on Probes as Participatory Design Practice (Jarke & Maaß, 2018).

As mentioned in the introduction to the origins of co-creation (chapter 1.4) one of the main reasons for having users participate in design processes is that they bring their expertise into the design process so that a successful design outcome (whatever that may be) is more likely.

We will now present the use of probes in Bremen Osterholz which allowed us to explore and learn about the everyday lives of older adults in Osterholz in a structured and reflective way, but also to establish our participants as experts of their district and ageing in this place. In particular, we analyse to what extent the probes served as boundary objects among users and between users and researchers, and how they facilitated individual and communal perspective making and perspective taking

In **Bremen Osterholz** a set of probes including maps, a diary, postcards and a disposable camera (see figure 23 below) was developed. The participants kept the cultural probes for 10 days. They collected data on themselves, their lives and their socio-spatial and media use practices. Follow-up interviews were conducted individually to prepare and accompany the process and a de-briefing session (workshop) to supplement, validate and explore the data.

Cultural Probes for map-based application for a district in Bremen



Figure 23: Examples of cultural probes artefacts as used in Bremen

In a subsequent workshop the participants jointly reflected on the activity and their experience. The aim was to define some key characteristics that would serve to develop personas. In Appendix D we provide an overview table of the cultural probes that were developed for the field site in Bremen Osterholz.

When participants compared the individual maps they discussed what they believed to be differences that would eventually allow for the development of different personas. Some of the key differences were: biographical (on whether somebody just recently moved to Osterholz), related to retirement/employment, living circumstances (alone vs. partnership vs. caring for partner) related to mobility and health, related to the financial situation and how active people were in terms of charity work and hobbies. All these considerations were noted and informed the subsequent development of personas.



Figure 24: Participants discussing their maps and post cards

4.5.1.2 Mapping socio-spatial networks: Explicating perspectives and demarcating areas

One probe we gave to participants was a map of the district. The main aim of this probe was to understand social inclusion with respect to primary networks and space. Participants were asked to mark where they live (red dot), where friends and family live (blue dots), where important places for their everyday are (yellow dots). In addition, participants were asked to highlight areas they particularly like in green, and areas they dislike in pink.

What we were interested in learning from this map concerned for example how connected our participants felt to people/places and the spatial dimension of their primary networks (neighbourhood, quarter, district, and clubs). We were also interested in learning which social networks the participants were part of and where they meet.

The returned maps differed greatly with respect to the extent of the networks and the mobility patterns. The maps were supplemented with the diaries and a set of seven maps in which participants documented their routes for a week. Not surprisingly we found in the analysis of the district map that the participants' social networks are very much centred around their respective neighbourhoods. Since the participants live in very different neighbourhoods their social interactions take place in different areas of the district. Preferences for certain areas as well as aversion regarding others also differ with regard to their primary networks.

Below are two cutouts from the maps of two participants. They both comprise of the same area. Yet, where participant 5 has highlighted an area in pink (signalling that this is an area she does not like), participant 10 marked the area with a blue and yellow dot (important places) and highlighted an area close-by in green (areas participants like). In the interview, participant 10 explained that this is where she walks her dog. Again, the participants lived in different neighbourhoods and hence had very different mobility patterns and social relations in and to the area.

Later on, such conflicting perspectives became a rich resource for discussion, when determining which places would be included as “nice places” in our district guide.



Figure 25: Probe - district map



Figure 27: Cutout of map participant 5

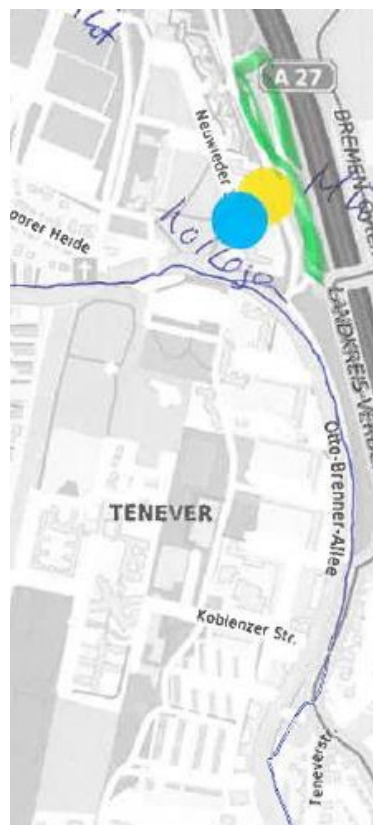


Figure 26: Cutout of map participant 9

Another difference in marking locations on the map was based on the different practices of people and what associations they had with particular places. For example, while a number of participants marked the big cemetery as an area in which they liked to spend time, one participant only marked it as place she routinely visits because of the graves she has to attend to. The places were hence associated with the practices in which people engage and through these practices became part of the socio-spatial network.



Figure 30: Cutout of map participant 5



Figure 28: Cutout of map participant 7

Figure 29: Cutout of map participant 3

Finally, many participants marked similar places in the district as reference to where they routinely go. Yet even here, we find differences with respect to whether these were also considered or known as recreational places.

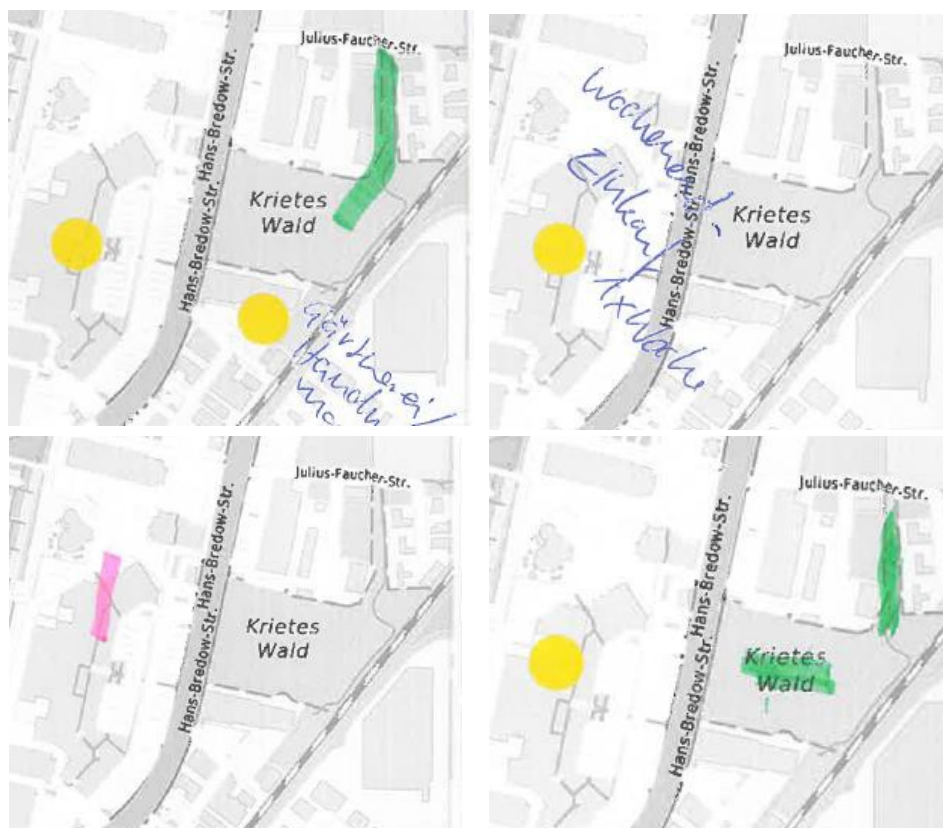


Figure 31: Cut-out of the same part of the map from different participants

These initial findings were further explored in individual interviews with the participants. Talking about the maps and the mappings in the interviews encouraged almost all participants to reflect on the district as a whole, its multifaceted character and its image. Here we found that the spatial separation depicted in the maps corresponded with a stereotypical and often negative attitude towards other neighbourhoods. In particular two neighbourhoods, one characterised by tower blocks and widely known as socially diverse and troubled area (Neighbourhood A), the other one with a rural character and detached houses (Neighbourhood B), are important points of identification and demarcation for the residents. As participant 1 who lives in Neighbourhood B explains:

Yeah, my own neighbourhood, I like that one. [...] I wouldn't like to live in neighbourhood A for example. [...] I'd rather be in the area where I live now or I prefer this. It's kind of like that, a little bit closed off and you know a lot of people and there's a lot of greenery and gardens. Whereas in this tower block neighbourhood, that doesn't suit me at all, I don't like that. I don't want to say that it is terrible, but for me personally, if I had an apartment there, I think I would be truly unhappy. Those tall houses, that overwhelms me. At least to live there. And I never actually go there. If we go on excursions, all right, then we go here to the dike [points to dike on the map] or, if we say "come let's go for a little walk in the evening", then we move around the clinic park, which is also very nice, because it's a lot of greenery and some nice old buildings and if you walk around there for an hour, then you have a little bit of time off your mind.

Participant 7 who also lives in Neighbourhood B, had a more nuanced view on Neighbourhood A. He praised the success of social urban development actions and said that he had “learned to appreciate” the area since there had been renovations that “have made Neighbourhood A somehow attractive”. However, he mentioned the neighbourhood only when asked why he had not marked any areas that he did not like in the map. Seemingly his assumption was that we’ve had this specific neighbourhood in mind when asking for disliked areas. Further, he confirmed that there are prejudices amongst his neighbours:

Nevertheless, it is the case that as [Neighbourhood B] you actually avoid [Neighbourhood A]. Because there were also incidents that young gangs somehow attacked people in the early evening hours or something like that.

The map was hence not a mere representation of the participants’ place-making practices and tacit knowing of the district but also a performance of what they considered to be socially acceptable, e.g. to mark Neighbourhood A negatively or not.

In contrast, participant 9 who lives in Neighbourhood A produced a very different image of her neighbourhood. She had lived there for a very long time and had “always found it exciting, always interesting”. She told us that

... acquaintances of ours had said that you can't move to [Neighbourhood A] [...] but I was still unbiased, I thought I'd take a look and now I'm living there and the apartments are really nice and we have a great view from the seventh floor.

She explained that in her opinion the bad image of the neighbourhood was no longer justified today. She had a strong attachment with the neighbourhood and the residents that was rooted in the togetherness of the people living there. She appreciated the ways the residents interact and treat each other, and recounted her negative experiences with neighbours when living in a different neighbourhood for a short while:

The others who owned the condominiums, they were upset that some families had a barbecue. So that was ONE situation, no, that's how it went. And then you really don't feel well. And then other things like that, like bullying and harassment. [...] Something I don't know from here [Neighbourhood A] at all. Because here its really such a peaceful togetherness and doesn't matter whether one is running around in the pyjamas outside or not. Maybe we smile about it (laughing), but there is no one to blaspheme about such things. That was a little bit there, as I said, it was a little bit different.

Despite these divergent perspectives on the different parts of the district, the participants realised some commonalities regarding preferred and avoided spaces: They differ with respect to the specific areas that they like or dislike (e.g. figures 26 and 27), but the reasons for these preferences are the same. All of them like to visit calm, green recreational places and they avoid places where young people often meet. Participant 9 explains:

[...] and that's the big parking lot and there are a lot of young people meeting with the car and so on and sometimes it's a bit uncomfortable. I don't really know any really unpleasant places like this. But these are such meeting places for young people, where you just feel insecure and you think they're talking to accost me and stuff like that, yeah.

Participant 5 who differs quite a lot from participant 9 with regard to her socio-spatial networks perceived the same sence of discomfort at places with many young people:

I don't like to go to the lake anymore, because of things that you don't like as an old person anymore, yelling youths and barbecue sessions, where the rubbish is just left and so on and so on. [...] I don't want to get upset about it. When I was younger, I was able to ignore these things but with increasing age it is strangely

more difficult and since I don't want to become a militant old one I choose the avoidance tactic.

Hence, what could be derived from the individual probes and interviews was an appreciation of the participants for green and recreational spaces. Despite differences on where these areas could be found in the district, they all emphasised the importance of green areas. Similarly, we noticed an agreement to avoid places where young people hang out and may intimidate older citizens. These were all individual perspectives that participants made through their engagement with the probes and while reflecting on this exercise during the interviews.

However, it was only during a workshop in which the *participants jointly interpreted the differences in the maps* (which were displayed on a pin board as depicted in figure 9) that we started to understand some of the reasons for these differences. These interpretations were based on taking their respective perspectives and through interpretation of the assembled maps the participants created a joint, communal perspective.



Figure 32: Participants discussing their maps during a workshop

One of the biggest differences—according to the participants—was whether somebody grew up in the district and still had friends, acquaintances and family from that time or if most of the social network lives somewhere else. Participants pointed out that this could be seen in particular in the number of blue marks on the map (representing family and friends). A second difference was considered whether somebody still works and also where somebody has worked (as these could have included long commutes with little chance of colleagues living the district). The financial situation was considered as another defining difference (e.g. with respect to buying organic food or owning a house and garden). This makes a difference in terms of shopping behaviour or whether somebody goes to public parks more often for recreational purposes. Furthermore, the functional health is important with respect to people's mobility in the neighbourhood and beyond. Lastly, it makes a difference whether people are engaged in charity work and if so, where (some people work within in the district, others across the city).

Relating these accounts of our field work back to our theoretical framework, we argue that working with the neighbourhood map facilitated the perspective making and perspective taking of participants in three ways: The neighbourhood maps served (1) as a standardised form and method, (2) as a coincident boundary and (3) as an ideal type.

Standardized forms, methods and procedures enforce a shared view by enforcing particular work practices across participants and provide a shared format for providing input. The

neighbourhood map acted as a standardized form by asking people to identify where they lived, where family and friends lived and where important places were. By asking participants to follow this particular procedure when working with the map, it became a standardized form (or method). In so doing, it allowed for the translation of different contexts into the same pattern (colour-coded dots).

The map served also as a *coincident boundary* in that it outlined the demarcation of the district. Through this framing only those activities became visible (and relevant) that took place inside this “coincident boundary”. Many of our participants reflected on this. For example, participant 5 reflected about how she perceived of the district differently when she was still working and commuting to another district in comparison to her reduced mobility patterns within the district since retirement. Participant 7 reflected in the final focus group about how many of his activities took place outside of the district and how much he used the car to get to places. This coincident boundary later became inscribed into the app we co-created with the participants.

Finally, the neighbourhood map facilitated the creation of *ideal types* such “nice places and walks” as we asked the participants to mark places/areas they like and dislike in the map. There was an initial broad understanding of what a nice area would qualify as. This “ideal type” became more and more refined as the design process progressed. Initially our participants had different ideas and understandings of what qualified as a nice place and also where they might be found in the district. These differences were important for negotiating the future design of the information system. For example, the conversation about the nice places informed the definition of attributes to describe nice places later on in the process (e.g. how to get there, whether there are benches and toilets, whether there are possibilities to get refreshments).

Drawing emblems and portraying neighbourhoods: From demarcation to diversity - developing a joint perspective on the district

Another item that was included in our probes pack was a disposable camera. Such cameras are a standard probe and we used it in order to “see” the district through our participants’ eyes and potentially capture their emotional bond to the district. Participants were asked to take pictures considering the following questions:

“What do you do/where do you usually go? With whom do you speak if...?”

- You feel lonely
- You are upset
- You need help
- You want to relax
- You want to get diversion



The pictures that the participants took differed very much with regard to their direct living environment. Participants reported that the camera made them reflect

Figure 33: Probe - disposable camera

on their everyday practices, their neighbourhood infrastructure and their mobility patterns in new ways:

So, usually you just follow your everyday routines, and you think that all is fine or not. But when I had this camera in my hand and then somehow I had to take pictures of places that are important to me or where I am often, I saw them in a completely different way. I mean, I think it's nice to have a bus stop in front of the door, but then I realized that in a completely different way. That's why it was worth taking a picture of it.

Hence, the camera facilitated the individual perspective making of participants, mostly with respect to their immediate neighbourhoods as these were the most common motives. Participants took pictures of those places they felt comfortable, places they liked etc. The differences depicted in the maps again became obvious in this task and the most common motives were tower blocks and old farm houses.

The two participants who live in Neighbourhood A took pictures of their neighbourhood where the tower blocks are in the back and recreational spaces and trees were in the foreground, demonstrating the quality of life in this neighbourhood (e.g. figures 34 and 36). Other participants portrayed the old farm houses and family homes that characterise their neighbourhood. If they took pictures of the tower blocks, they looked rather bleak. For example, figure 35 features a tower block with a big road/tram line in the front of the picture, and hence producing a very different image of neighbourhood A than figure 34 and 36 that forefront green areas and a beautiful sunset.



Figure 34: Picture by participant 9 featuring a lake, trees and green spaces in front of tower blocks



Figure 36: Picture by participant 10 featuring great green spaces between tower blocks

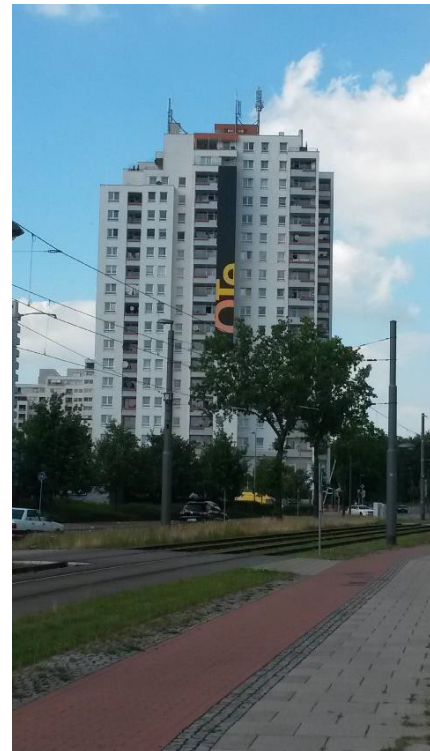


Figure 35: Picture by participant 11 featuring one of the tower blocks. In the front is a big road/tram line

These different perspectives of participants were also present in

their neighbourhood maps. The pictures helped participants to see unfamiliar areas with the eyes of a resident and discover beauty in places they had deemed ugly or unattractive. It allowed them to take their respective perspectives and overcome some of their prejudices to some extent.

Another probe that asked participants to portray their district was one of the postcards. For the postcards, participants were asked to draw a doodle or imagine an emblem of their district. The idea behind this probe was to learn about what participants considered makes the district unique, what is characteristic about it and what stands out. In addition, this postcard was meant to be a fun way to invite participants to be creative. Some of the participants drew, others just noted down a few key words. There were a number of interesting co-occurrences in the emblem postcard. Participants 1, 3, 4 and 10 all included *tower blocks* (Hochhäuser) and *timbered* (Fachwerk) or *thatched houses* (Reetdachhäuser) into their emblem. For participants 3 and 4 it was the last on a list of characteristics. For example, asked about elements of an emblem in his interview, participant 4 added reluctantly “and a tower block, that’s how it is”. Participant 10 who lives in the tower block

neighbourhood did not seem to mind the tower blocks. In contrast to others, she drew a number of tower blocks and next to it people. In the interview she had also pointed out how strongly connected people are in her neighbourhood. In order to account for other parts of the district, participant 3 also suggested including terraced houses in which families live.

Four of the participants (2, 4, 6, 10) included trees (or one tree) in their emblem. For participant 2 this was a reference to “holz” (engl. wood) in the district’s name. Participant 4 recalled that “there used to be a forrest here”. Participant 3 listed “wheat fields” as a reference to the districts agricultural past.

Below are two examples of the completed postcards featuring ideas for emblems.

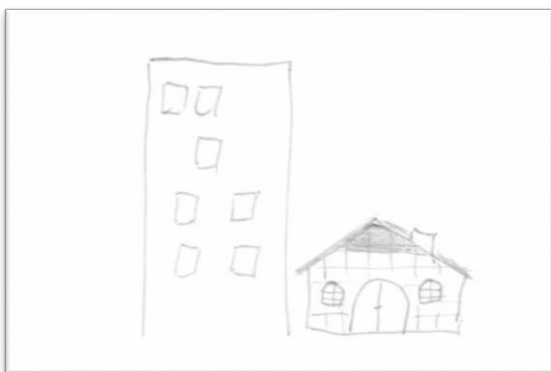


Figure 38: Postcard by participant 1

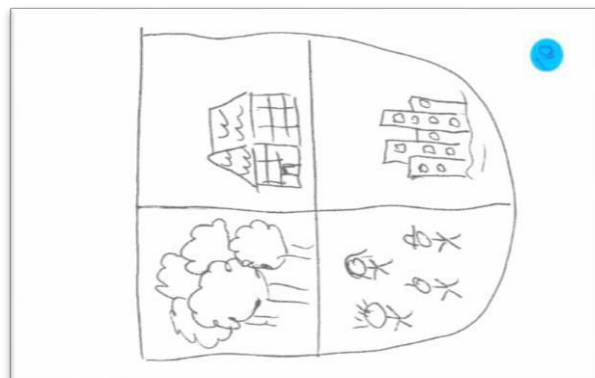


Figure 37: Postcard by participant 10

These particular postcards turned out to help the group to develop a joint perspective on the district that comprises of the differences revealed by the map task. When interpreting these postcards the participants expressed a shared desire to improve the image of the district as a whole, which helped to bridge their differences and dismantle prejudices amongst the different neighbourhoods. Throughout the process of developing a digital district guide an important motivation for all participants was their concern to improve the image of the district as a whole. This common objective helped developing a joint perspective on the district that interestingly emphasizes its diversity as an advantage.

One reason why the postcards and the photographs were effective probes for making a joint perspective about the district was due to the ambiguity of their tasks: The motives of the pictures differed between the participants featuring people, architectures, infrastructures, vehicles, places, obstacles, home, public spaces, private gardens etc. and together formed an assemblage of things that mattered to the participants and allowed to be queried for different types of questions. In this respect, the photographs as well as the postcard served as a *repository* of different preferences, experiences and routines.

4.5.1.3 Envisioning the future: From individual uncertainties to joint future challenges

A second postcard asked participants to respond to the question: “What will [district 1] look like in the future?” The aim was for participants to imagine the future of their district and invoke associations about visions and ideas for a service. We also wanted to learn how people felt about the future of the district in positive or negative terms, what they perceived to be the main challenges and issues and how the district could be improved. The returned postcards were similar insofar as most of them revealed an uncertainty regarding the future development of the district. However, they differed with respect to what exactly was perceived as problematic.

One issue that came up quite often concerned the perceived increase of the share of people with migration background in the district, which caused a sense of insecurity among some of the participants. Participant 1 explained her postcard as follows:

Yeah, well, it [the district] certainly changes yes. [...] It's, yes, I'll say it very carefully, you start to think, what I have quite clearly is a feeling of insecurity. I have to say that. I don't want to say that it's the refugees, but everything that's somehow related, right.

And participant 7 expressed his wishes regarding the future as follows:

The future, what does it look like? That we don't have enough places for all the children and for all the nursery children and if one day this would be guaranteed, that would be a nice thing. Because that is not the case at the moment. We lack so many kindergarten and nursery places and in schools, the teachers feel overburdened, because now more and more children are coming in, who have a special need for support. I can't even imagine we could do that. If we still get more refugees now, how will that work? How can that be possible? So that would be a future project for me, all the children have a place in school and a place in the kitesurfing school, which I would also like to see in the future.

Interestingly both, participant 1 and participant 7, live in the neighbourhood where fewest people with migrant background live. In contrast, participant 9 who lives in Neighbourhood A, the neighbourhood that has always been very mixed with regard to the cultural background of its inhabitants, expressed a much more optimistic view on this issue:

Well, I'm not afraid now that too many foreigners are coming in or refugees or anything like that, I'm too serene in this regard. We've already been through all this and it was really bad here and yet it was still alright.

As the quotes demonstrate: the fear of alienation through migration is strongest amongst those who are not used to live in multi-ethnic and multi-cultural neighbourhoods. Participant 9 however has a long-standing experience in living next to “foreign” people. The postcards here helped to share this experience and thereby facilitated perspective taking. Other uncertainties that came up through this postcard concerned the future of the retail industry and the increasing development of green and recreational space.

Hence, the postcard relating to future-making facilitated participants' joint perspective taking and making on how they envisioned the future of the district. During the workshop, a joint perspective formed that moved away from the perceived issues themselves to the responsibility of policy and administration to respond to these future challenges. As



Figure 39: Participants discussing the postcards at a workshop

participant 3 stated: “The local administration or city or whoever is responsible for it, would have to make sure that this works out [...]”. The taking of the respective individual perspectives allowed to make a joint perspective with respect to thinking about how to tackle challenges rather than being trapped in a diffuse fear. Figure 39 depicts some of the participants during the workshop while reading each others responses.

In addition, participants reflected upon what they were missing in district 1 and many mentioned that it was young people. Some said that this was also reflected in the fact that there are only few places for going out (e.g. for a coffee in the afternoon or a drink in the evening). Some believed this was also an infrastructural problem (e.g. with respect to the tramline).

A further part of the conversation circled around charity work in the district and how this may support the development of the district. One idea was an app to support this, e.g. a platform for people that need help in their neighbourhood. Some participants reported on how they were already helping older neighbours with their weekly shopping. Another discussion was around the idea to build student houses and make the district more attractive for younger people and in this way “raise” people who are willing to take over charity work.

Hence, when displaying the postcards in our workshop they served again as a *repository* that allowed to be queried as various ideas, concepts, objects were collected and allowed for a creative process. It also served to envision an ideal future.

4.5.1.4 Conclusion

The probes (also through the interviews and the workshop) provided an opportunity to establish the older participants as experts of their life course and of experiencing the process of becoming older. They also allowed them to document and reflect on their everyday practices and practices related to ageing, technology use, and the appropriation of the district when becoming older. Probes sensitised participants about certain aspects of their everyday practices and were hence tremendously helpful in identifying needs and resources. For the researchers they allowed to develop a better and more profound understanding of these practices.

Probes also facilitate the individual and communal perspective making and perspective taking of participants. Above we have presented some of the probes that we used during our participatory design project and how we used them. In contrast to other accounts found in the literature, the interpretation of probes were not used as an inspiration to us as designers (probes as response), neither were they used as mere representations of the interpretations of the participants. Rather what we would like to argue is that the probes facilitated a process of perspective making amongst the participants and perspective taking between participants and researchers. There was a transition in the ways in which probes were interpreted from what was important to individual participants to what may be interesting to others.

The following Table 8 summarises how probes facilitated the articulation of the different socio-spatial dimensions of social inclusion:

Table 8: Articulation of socio-spatial dimensions of probes

<i>Socio-spatial dimensions of social inclusion (Wiles et al, 2012)</i>	<i>Participants' expertise & their tacit knowing of the district/their neighbourhood</i>	<i>Articulation in probes</i>
sense of attachment and social connection	<ul style="list-style-type: none"> - knowing a neighbourhood - grounded in everyday experiences of growing older in the district 	<ul style="list-style-type: none"> - Dependent on own socio-spatial networks as depicted in maps (participants became experts for their neighbourhoods)
sense of security and familiarity	<ul style="list-style-type: none"> - knowing where to find relevant information and resources - definition of what relevant information is 	<ul style="list-style-type: none"> - Avoidance of places where a lot of young people "hang out" - Location of toilets, benches - Access to public transport (information)
sense of identity, linked to independence and autonomy	<ul style="list-style-type: none"> - knowing where organisations and places are located, which services are provided, and how to access them 	<ul style="list-style-type: none"> - Nice places, defined by green areas - Places of historical importance

The first dimension of socio-spatial inclusion that Wiles et al. (2012) list is *older adults' sense of attachment and social connection*. This includes participants' knowledge about their neighbourhood and is grounded in their everyday experience of growing older in the district. This dimension came to be expressed in participants' wish to include nice places and walks into the digital district guide rather than merely listing organisations (e.g. related to health services). As such, nice places are dependent on the circumstances, abilities and preferences of older adults. For example, the second dimension listed by Wiles et al (2012) relates to the *sense of security and familiarity*. Knowledge about those places was important in order to be able to plan a visit. One of the tasks of our participants was to define what information was relevant and important, what kind of attributes were useful. This dimension came to be expressed through data on the location of toilets and benches, but also through information about public transport (e.g. how to reach a place) or information relating to accessibility. The third dimension relates to a *sense of identity, linked to independence and autonomy*. Our participants expressed a need to know where organisations and places are located, which services they provide and how they can be accessed. For example, information about the accessibility of public buildings enables people with mobility impairments to better plan their trips and hence increases their independence and sense of autonomy. This dimension was expressed through detailed information about nice places (such as the descriptions).

Overall, the probes helped to make participants become aware and to articulate their tacit knowing. For example, certain beliefs and assumptions they had about particular places in the district and whether and why they liked to go there or not. Being open with each other and being able to take perspectives about some of the differences, helped in identifying what and why nice places were an important feature of the district guide. Hence, probes may enable perspective making and perspective taking within design teams of users, developers,

researchers and others. In this respect, perspective making relates to Gaver et al.'s (1999) intention to elicit unexpected ideas beyond the needs and desires participants already understood. Understanding probes as boundary objects may provide a fruitful way of conceiving and developing probes in participatory design contexts as well as conceiving of new or alternative ways of embedding their interpretation and reflection throughout the whole process and not just for requirements elicitation.

4.5.2 Probes in South Lakeland: exploring older adults' practices around social participation, technology and open data

Different types of probes were used at different stages of the co-creation process in South Lakeland. In phase one, a diary/ calendar probe was used to capture participants' everyday life, and also explore what their ideal schedule of activities and what meaningful social participation would look like. The calendar probe was a simplified version of a cultural probe that we used at one of the first co-creations workshops. We provided the participants a week planner for them to fill in on their own, also asking them to give copies of it to their friends. We asked them to write down the things they did in their week and what they would like to do in an ideal week.

At another workshop, we used a variety of different mobile devices as probes to gauge the varying levels of knowledge and expertise with IT amongst our participants. We sought to gain insight into how our participants used mobile devices, their experience with internet and with searching for information on the internet.

Later in the co-creation process, once the development of the demonstrator apps had reached a good level of stability, we installed them on tablets. They were used by our participants autonomously. Thus once we had a working version of the app and tablets that participants could take home, this presented an opportunity to deploy a digital cultural probe that would allow us to learn more about how a technology, and specifically the one we were developing, would fit with older adults' practices. This could be described as an exploratory way of testing (the app, the service and the fit of the technology). Contrary to the user testing we performed at different stages of the co-creation process, with the use of the probes there were no predefined tasks to be undertaken by older adults. The instructions asked them to take notes and photos of their use of the app, their attendance to events through the app and their impressions of using the app. Using the app as a cultural probe had two objectives:

- To test the app in their own lives, by themselves. They co- created it. Does it do what they expected to do?
- To explore how the data on the app fit with their own routines around attending events

The probes provided to the participants were inspired by more established cultural probes that had been used in Mobile Age and in other co-creation projects (such as maps, diaries and cameras. Our digital cultural probe consisted of a tablet with a working demonstrator (prototype) of the Social Connectedness Apps (including the events app, services app, volunteering app, contribute a poster app and the user profile under a trusted portal/launcher), a journal for them to capture their daily activities, interactions, perceptions and ideas for improving the app. There was also a sheet explaining what a cultural probe was. It provided instructions for taking pictures of their daily lives using the camera in the tablet, and explained what the SL team were going to do with the data collected.



Figure 40: Tablets and journals were the components of the phase two 'cultural' probes

The experiment lasted two weeks (23/02/2018 - 09/03/2018), during which participants were able to engage with the open data available and to co-create data by uploading pictures of posters of local events to the server using the 'contribute a poster' app. One of the early findings of the project, during the initial exploration on older adults' practices in phase one, was that there were a series of small, casual or unofficial local events (such as car boot sales, for example) that only got advertised in posters and flyers on notice boards and other physical locations. Most the information on these types of events would not be available digitally as open data. The aim of this part of the social connectedness app was to enable older adults to collect information, complementing the open data available from official sources. Examples of the data generated by the participants can be seen in Appendix C under South Lakeland Mobile Age social connectedness app demonstrator.

During one of the co-creation workshops the probes were returned and we conducted a debrief of what information they had captured with this activity. We used headings and post-it notes on boards to capture and organize overall themes around their experiences and we had a group discussion about it. This was an important step to help provide context for later analysing of the data captured in the journals and cameras.



Figure 41: Workshop when the probes were returned

Participants fill in their journals with different purposes. Some used to account for all their action of each day, including routine activities such as reading and driving their partner to appointments, as well as observations of how they used the Social Connectedness Apps. Others only mentioned when they used the apps and attended events, noting those that they found though the apps. Others used it as a log for when things went wrong either with the app or with the tablet they were using as part of the cultural probe.

Themes that emerged were:

Problems with the hardware: In particular with those not used to tablets or that only used iPads before, reported many problems. For example, not being able to take screenshots, not realising that they had to press the tick to save the photographs and Icons and widgets disappearing from their screens.

Problems with the data: they found events that had listings with the wrong address or that not specific enough date and time.

Difficulties using the search function that was more complicated than they expected.

Discoveries: They discovered new public transport options that they were not aware of. For example, that there were buses that could link two different villages and that the app indicated which bus stops that get in and out.

They were impressed to see that the app would direct them through short cuts that only locals tended to know about.

One of the participants planned a series of horticultural events for the entirety of the spring season and added to her calendar.

The facilitators were impressed how thoughtfully and thoroughly participants filled in the cultural probes, as this methodology can produce unreliable results. Our experiences with conducting cultural probes have been quite successful. By deploying the probes late in the co-creation process we had already established a strong relationship with participants and we believe could have helped them to trust us to value their inputs. We received journals filled

with detailed accounts of their experiences, feelings, troubles and actions that help us further develop the apps and ideas for service to supports the deployment of the apps.

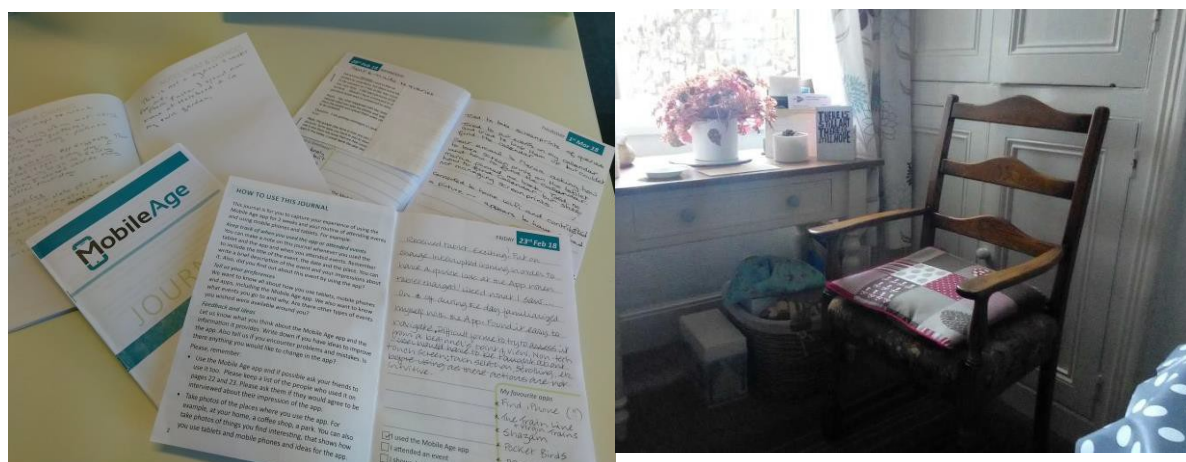


Figure 42: Some of the journals filled in by the participants of the cultural probe experiment at the later part of the co-creation process in South Lakeland and an example of a picture captured with the tablets

The probes also led to insights around the difficulties of working with open data and capturing data through the app. The probes brought to light issues that we not discussed during our workshops and were only ‘visible’ with use.

Uploaded photos of posters suggested that the ‘contribute poster’ app could be developed further into a powerful tool to share local information. Some successful attempts were very encouraging. By successful we mean that the images were of good quality and had relevant information on local events. However, it was through the bad quality images that the SL researchers faced the challenge to work with data generated by the user without some sort of curation or control. Some of the images uploaded were so blurred they could not be read. Others were uploaded by mistake, for example the image of a chair. In this case, the content of the image was, although harmless, not appropriate. The app has been improved since then based on the users feedback and now users are able to delete the images they upload by mistake. While the bad quality images in this case were uploaded unintentionally and could easily be removed, it is conceivable that some users might intentionally upload inappropriate images, offensive images, advertising or fake events. This will require some sort of curation when the apps are adopted by a service.

In addition to co-creating their own data, the participants had the opportunity to work with the open data available on the social connectedness app on their own, within their homes and routines. That prolonged interaction with the app provided interesting and rich insight into data issues.

For example, the interaction highlighted the vulnerability of the older adults when they were relying on the open data provided by the apps. Some of the entries on the database had errors that had the potential to be dangerous. For example, the information on a local event had the wrong location and misguided the users. It indicated a 3-minute walk to what in reality was a 7 mile journey (quote from workshop 22 or email from participant). This type of mistake could be identified through the full revision of a fixed database. It prevented that the wrong information was integrated in a printed guide or even on static websites where the content cannot get updated or changed through live open data. However, on live open data apps and listings, such mistakes can appear at any point and are difficult to identify as it

requires detailed knowledge of the entries that would only be known by those making the incorrect entry themselves.

Other examples include the issues related to incomplete or not refined data. For example, exhibitions are usually listed stating their starting date and the finishing date. The date range often includes dates when the venue is not open, however these exclusions are not specified in the datasets used. This makes it possible to enter events in the calendar on days when the venue is not open. Without checking each individual entry there is currently no way to solve this problem. What is needed here is better notation of the open data so each day the event is taking place is entered individually. For that to happen, an agreement needs to be reached with data providers/ service providers to submit data in a standard way. This will require the commitment to manage the open data from the service adopting the apps in the future.

The demonstrators developed through our co-creation process served as probes that proved to be an important tool to articulate and provide evidence of the concrete reality of working with open data. It highlights both the benefits of using open data but also the risks and commitments to be made to secure the apps against these risks.

4.6 Personas

Personas are defined by Cooper (1999) as ‘hypothetical archetypes’ of real users. Very often personas are created by the research and design team from insights gained through other research methods (e.g. interviews, ethnographic observations/participations in activities with older adults, focus groups, demographic data on older adults). Hence, personas are a representation of a fictitious user that includes a concise summary of characteristics of the user, their experience, goals and tasks, pain points, and environmental conditions. Personas allow the developers to consider the needs, wants, expectations etc. of wider user groups, without involving them directly in the design process. By drawing attention to potential users, the creation of a common understanding of the users is supported and developers are engaged to implement this understanding in their decisions.

In **South Lakeland** personas were used in workshops to help identify the needs of older adults, including those under- represented in the co-creators core-group. The personas the SL team created were also helpful to identify groups that were not yet involved, for example family members. They helped explain how their practices differed from other groups represented by other personas. In addition, personas were also used to articulate who the potential users were including older adults and intermediaries, such as family members, volunteers and support & care workers.

In **Bremen Osterholz** personas were jointly developed with older adults, based on the work with cultural probes. We developed three personas based on the cultural probes and individual interviews with our participants as well as statistical data on older adults. In this stage, we used personas to examine communication- and information needs as well as resources of older citizens in Osterholz. The personas played an important role throughout the co-creation activities. Based on the personas we developed two use case scenarios.

The personas still differed according to a number of important dimensions as outlined in D1.4 (Study on accessibility, mobility and open data), namely:

<i>Factors influencing access and social inclusion</i>	<i>How factors were considered in our personas</i>
Demographic/personal	Age, gender, living arrangements, household type, mobility, relationship, health & well-being
Socio-economic	Income, employment/retirement, urban
Social and political	Social networks, social capital, charity work and political participation
Use	Needs for access/motivations, relevance, existing practices
Device and content	Media repertoire (type of devices owned)
Infrastructure	-
Attitudes/feelings	Trust in technology, confidence, self-attitude
Skills and support	Family members, time used, knowledge of options

Table 9: Considering social inclusion and accessibility systematically through personas

For a detailed description of our personas see Appendix E.

The participants worked in three groups, each on one persona in order to identify their information needs and interests.

- What needs and resources do they have?
- What functions and objects should the map/application contain regarding this needs and resources?
- And how should these objects be structured/filtered?

The results were noted on cards (colour-coded according the points above) and pinned on a wall.



Figure 43: Collecting results from group work

Personas provided a good basis to discover and discuss the information needs of the older citizens. Similar to South Lakeland, personas were helpful in Bremen Osterholz for encouraging participants to think not only of their own wishes and needs, but also to relate to others who might be different from them. However, if personas are based only on the probes of the co-creators, they may only marginally be representative beyond this sample. Thus, it is

important to include further information such as quantitative survey data on the life situations of older adults.

Overall, the result was a manifold of relevant object categories and attributes to be visualised on the map, which later turned out to be too numerous for the scope of the project. Further, the personas helped to generate ideas for the service definition. The main point here was that the participants felt that it is important to focus on the resources an older person has.

4.7 Data Walkshops

Walking is a human activity, engrained in urban and rural culture. It is also becoming a prominent method in projects related to data and critical data studies (Wieringa & van Es, 2018) as well as participatory design (Kanstrup, Bertelsen, & Østergaard Madsen, 2014). What makes such walks an interesting and important tool for engaging (critically) with data is their embeddedness in everyday urban life. Data walks have been proposed and conducted in a number of projects aiming to engage with data and putting an “emphasis on the everyday experience of data” (Wieringa & van Es, 2018) as well as the relationality of design (Kanstrup et al., 2014).

Wieringa and van Es (2018) have mapped a number of different formats each comprising of different set-ups and goals. For example while Greenfield & Kim set out to raise awareness/literacy on ‘networked urbanism’ among citizens, Van Zoonen et al. take city employees on walks through their own smart city. While Greenfield & Kim only delimited the area on a map, Van Zoonen et al. defined the routes beforehand. The focus of their walks was “identifying big data in the city and connecting it to political and ethical issues” (Wieringa & van Es, 2018). In so doing Van Zoonen not only raise awareness on data issues amongst civil servants, they also learn about the knowledge and beliefs of their participants with respect to the datafication of their city. Building on Greenfield and Kim and giving inspiration to Van Zoonen et al., Powell experimented with different forms of data walks: initially to teach students about big data & city, later to create “bottom-up knowledge”. In her walk, participants assumed different roles from note-taker to photographers. Yet another format of data walks was conducted by Hunter, who did not only want to raise awareness but also collect data on their walks. They were gathering environmental data on a specific area and built a multi-layered “dataspace”.

	Greenfield & Kim	Powell	Van Zoonen et al.	Hunter
Type of workshop	Networked urbanism	Data walks	Data walks	Data walk
Goals	Raising awareness/ literacy on 'networked urbanism'	Originally teaching tool against celebratory rhetoric. Now raising awareness and 'creating bottom-up knowledge'	Gaining insight into civil servants' ideas and beliefs about datafication, and "strengthening their critical interrogative attitude" (p. 1)	Examining tools and technology for data collection, and experimenting with data visualisation
Number of participants	15	5 per team (with a max of 15)	4-6	-
Type of participants	Mix of locals and domain experts	Different audiences. Originally students, now citizens	Civil servants	Different audiences (e.g. students, conference visitors)
Roles of participants	-	Navigator Photographer Map-maker Note-taker Collector	Participants Participant observers	-
Duration of walk	90 min	60 min	60 min	Different lengths
Duration of event	Half a day	Half a day	„	Different lengths, from 3 days - 45 min. May be repeated throughout the year.
Event makeup	Walk - discussion	Briefing - walk - critical making	Walk - debriefing	Preparation - walk - visualisation

Figure 44: Inventory of different data walks [excerpt from Wieringa & van Es 2018]

Walking in the context of co-creation with older adults is particularly important as it relates to the importance of ageing in place and neighbourhood. Wiles et al. (2012) list three socio-spatial dimensions which are important to older adults' well-being in their neighbourhood:

- sense of attachment and social connection
- sense of security and familiarity
- sense of identity, linked to independence and autonomy

Each of these may be supported and further enhanced through joint co-creation walks.

In Mobile Age, co-creation data workshops were conducted in Zaragoza as well as Bremen. In both cases, groups of older adults jointly walked through their districts, noted their observations with pen and paper and took photographs.

4.7.1 Walking workshops in Zaragoza

In Zaragoza the walking workshops were embedded in a series of six sessions/interventions per district (overall three districts participated). The aim of the walks was to define age-friendly routes, routes which are accessible to older adults. To do so, older adults had to walk those routes and suggest improvements. Zaragoza used their already existing collaborative map service to digitise the information.

In each of the three districts, there was a group of six persons. To be representative, gender parity was sought and the group was made up of people over 60 to 75 years of age and 76 years and older. In each group, there were at least two people with a mild physical problem, a person who likes to walk or who belongs to hiking groups, a person who is an advanced user of ICTs and two with an average level. It is the City of Zaragoza (technical staff of the Senior Centre), who selected participants for the teams.

The first session was mainly used to explain the goals of the project and introduce participants to each other. In a second session, the participants defined two routes, which were important in their district (one long and one short) and what kinds of elements need to be analysed. After the first round of walks, the following aspects were agreed to be important:

Primary elements:

1. State of sidewalks (Tiles, slides, paving, recesses...)
2. Benches
3. Traffic lights and crosswalks
4. Points of interest (public bathrooms, green spaces, fountains, bins, dirt, mail-boxes, etc.).

Secondary elements:

1. Bus/tram stops (access, information panel, etc.)

In addition, the team developed a form in which participants could enter information while walking on route. This form was evaluated and improved after the first walks.

Figure 46: Amended forms for documenting walks

Figure 45: Initial form to document walks

Each of the older participants was assigned a task before the walks:

- Responsible for photographs
- Responsible for coordinates (GPS)
- Two pairs of two to observe, analyse and note ideas for improvements.

For both routes, the starting point was the Senior Centre. The first of them, since it was a long route, was carried out in 2 sessions (the first, from the beginning to the midpoint of the route and the second the remaining section). During the tours, the group observed the different elements to evaluate in order to improve the route. The route was carried out in group, although the observation was individual. In this way, whenever a member of the group detected a possible improvement proposal, the group evaluated it, and in cases where it was considered that their discussion and subsequent inclusion might be interesting as a proposal for improvement, a photograph and location references were taken.

When reaching the midpoint of the route (in the case of the long route), the route was reversed in the opposite direction, so that the team had the opportunity to review the proposals made and even incorporate new ones. When arriving to the meeting, the photographs were projected with the objective of deciding if the proposal was going to be maintained or not. For this purpose, the information obtained and the suggestion for improvement as well as its motivation were analysed. If on this basis an agreement was made on its selection, the improvement to be achieved was described as comprehensively as possible.

In the following session, starting at the midpoint of the long route, followed the methodology used in the previous session, to finish also in the meeting room. This process was appropriate and, apart from the limited time, it did not pose any problems. It showed a good functioning of the group, a sufficient capacity to reach consensus agreements and a high level of involvement.

The last session was dedicated to the complete itinerary of the two routes in order to validate the information that appears in the collaborative maps. The team checked if the markers that appear in the collaborative maps corresponded with the proposals they have made.

All the information was displayed on the tablets, while the group was walking the route and this way could be checked on site. This task has been rewarding for the senior team, as they have seen their proposals introduced on the City Council website, one more step towards the realization of the improvements.

In order to correctly locate each improvement an excel sheet was designed to gather all the information.

RECURSO	DESCRIPCIÓN	COORDENADA X	COORDENADA Y	FOTO (SI/NO)	NOMBRE FICHERO FOTO
	INICIO DE LA RUTA (Centro Mayores)	41°38'874	0°53'419	SI	DSC_001.jpg
PARADA BUS	Canallillo comunicación alcorques con agua	41°38'943	0°53'323	SI	DSC_002.jpg
PAPELERA	Cambiar posición	41°38'951	0°53'333	SI	DSC_013/B.jpg
PARADA BUS	Sin panel de información	41°38'943	0°53'323	SI	DSC_003.jpg
ACERAS	Acera en mal estado. Baldosas deslizantes	41°38'977	0°53'267	SI	DSC_004.jpg, DSC_005.jpg, DSC_006.jpg
CRUCE	Paso de cebra complicado. Mejor con semáforo	41°38'981	0°53'234	SI	DSC_008.jpg, DSC_009.jpg
ALCORQUE ÁRBOL	Necesidad de nivelar el alcorque	41°39'058	0°53'105	SI	DSC_009/B.jpg
PLAZA	Mal mantenimiento, bancos en mal estado	41°39'143	0°53'029	SI	DSC_007.jpg, DSC_008/B
PLAZA	Falta rebaje	41°39'160	0°53'024	SI	DSC_007/B.jpg
CRUCE	Falta señalización vías tranvía	41°39'198	0°52'47	SI	DSC_001/B.jpg
ACERAS	Acera en mal estado. Baldosas levantadas	41°39'318	0°52'793	SI	DSC_004/B.jpg
CRUCE	Pasos de cebra sin terminar rebajes	41°39'960	0°53'315	SI	DSC_010/B.jpg, DSC_011/B.JPG, DSC_012/B.jpg
CRUCE	Pasos de cebra sin terminar rebajes	41°39'173	0°53'043	SI	DSC_006/B.jpg
	FIN DE LA RUTA (Plaza del Pilar)	41°39'372	0°52'737	SI	DSC_003/B.jpg

Figure 47: Writing down coordinates

Below are two screenshots of the collaborative maps developed.

Link: <https://www.zaragoza.es/sede/servicio/mapa-colaborativo/579>

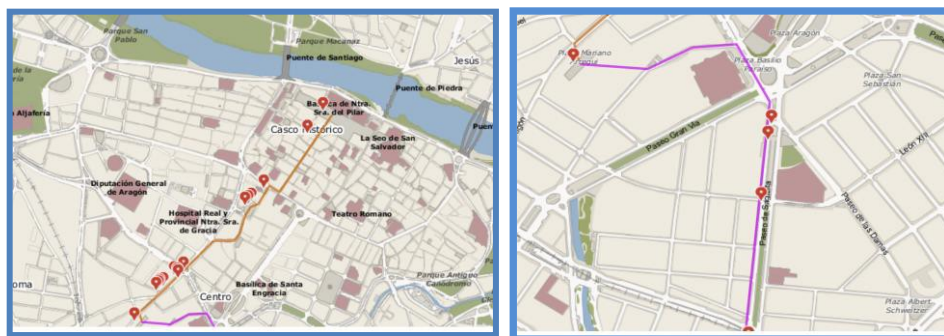


Figure 48: Final collaborative maps

4.7.2 Walking workshops in Bremen Hemelingen

4.7.2.1 Detailing the service idea for digital walks

In order to detail the service concept and define the data, we conducted a walking workshop in June 2017 together with the social activities manager of the protestant community centre. Most participants could walk without support, few had walking aides. The intended goal was to identify relevant attributes for walking routes (what information older adults need or are interested in on walking routes). Also, we wanted to raise trust in and interest on the project amongst the participants.

In the preceding project group we had agreed on a walking route through the neighbourhood Hemelingen and promoted the walk in the newspapers, via the core group and in an online event calendar of the district marketing. We had chosen to promote the walk as a joint walk through the neighbourhood Hemelingen in the first place (and not to emphasize the co-creation of technology), in order to keep the barriers for participation low. We had planned to walk together along the route and thereby to fill out a questionnaire on relevant attributes. The questionnaire had been developed based on literature on accessible and age-friendly neighbourhoods and cities.

MobilimAlter
Mobile Orientierung für und mit Senioren und Senioren gemeinsam erarbeitet

Spaziergang A rund um die Hemelinger Bahnhofstraße und den Tamra-Hemelinger-Park
Bitte kreuzen Sie an, was Sie für die Beschreibung von Spaziergängen und Wegen wichtig finden und machen Sie ggf. Notizen, wenn Sie unterwegs Entsprechendes entdeckt haben

Sehenswertes

- ☐ Architektur/Gebäude _____
- ☐ Geschichtliches _____
- ☐ Grünanlagen _____
- ☐ Kunst _____
- ☐ Sonstiges _____

Hilfreiches

- ☐ Sitzgelegenheiten _____
- ☐ Toiletten _____
- ☐ Geländer/handläufe _____
- ☐ Straßenbegrünung (Schatten) _____
- ☐ Beleuchtung _____
- ☐ Sonstiges _____

Nützlich

- ☐ Läden _____
- ☐ Dienstleistungen _____
- ☐ Sport _____
- ☐ Spielplätze _____
- ☐ Sonstiges _____

Gastronomie/Bewirtung

- ☐ Cafés _____
- ☐ Restaurants _____
- ☐ Kiosk _____
- ☐ Kneipe _____
- ☐ Sonstiges _____

Gehwege

- ☐ Gefälle/Längs- und/oder Querneigungen _____
- ☐ Engstellen _____
- ☐ Trennung zwischen Geh- und Radwegen _____
- ☐ Hindernisse _____
- ☐ Breite _____
- ☐ Höhe der Bordsteinkante _____
- ☐ Sauberkeit _____
- ☐ Belag/Oberflächenbeschaffenheit _____
- ☐ Sonstiges _____

Straßenquerungen/unvermeidbare Straßennutzung

- ☐ Ampel vorhanden _____
- ☐ Mittelinsel vorhanden _____
- ☐ Abgesenkte Bordsteinkante _____
- ☐ Belag der zu querenden Straße _____
- ☐ Größe (Fahrbahnen/-spuren) der Straße _____
- ☐ Verkehrsstärke _____
- ☐ Geschwindigkeit _____
- ☐ Sonstiges _____

Störendes

- ☐ Hundekot _____
- ☐ Dreck/Müll _____
- ☐ Lärm _____
- ☐ Gestank _____
- ☐ Radfahrer auf Gehwegen _____
- ☐ Sonstiges _____

ÖPNV Haltestellen

- ☐ Unterstellmöglichkeit _____
- ☐ Sonstiges _____

Figure 49: The questionnaire on attributes for describing walking routes

The questionnaire asked the participants “to mark what you think is important for the description of walks and paths and make notes if you have discovered something accordingly on the way” and offers response items in the following areas:

- Points of interest (Architecture/buildings, historical, green areas, art, other)
- Helpful things (benches, restrooms, railing/handrails, street greening (shade), illumination)
- Useful things (shops, services, sport, playgrounds, other)
- Rest points/provision of food and drinks (cafés, restaurants, kiosk, bars, other)
- Sidewalks (Inclination/longitudinal and/or transverse inclinations, narrow places, separation of footpaths and cycle paths, obstacles, breadth, height of the curb, cleanness, surface condition, other)
- Road crossing/unavoidable road use (traffic light available, traffic island available, lowered curb, surface of the road to be crossed)
- Size (lanes/tracks) of the road, traffic intensity, pace, other)
- annoying things (dog excrement, dirt/waste, noise, smell, cyclists on footpaths, other)
- Public transport stops (shelter, other)

There were nine older residents from Hemelingen. Some of them had participated in the focus groups, some were new to the project. We started with a short introduction of the project. Then we started walking the route. Only one participant was quite new in the district. All the others have lived in the district for a long time and were very knowledgeable about it. They had a lot to tell about the historical developments in the district, which turned out to be a main point of interest, when walking. On half way, we made a coffee break in the “Bürgerhaus”, where the participants were asked to fill out the questionnaire on attributes. Most of them were not interested in attributes for accessibility but much more in the history of places. After the second half of the walk, we went for lunch. While eating again the participants talked a lot about the history of the district and their personal stories.

The impression that the participants were more interested in interesting and recreational attributes than in information on accessibility was confirmed by the analysis of the questionnaire. 5 participants were interested in architecture and buildings, 4 were interested in historical information. 6 were interested in recreational spaces. While 7 would appreciate information on benches and toilets, only 3 were interested in information about traffic light almost none of them would appreciate any of the attributes concerning the pavement and the road crossing.

In a subsequent focus group we had planned to debrief the results on the attributes from the walk. We presented and discussed the results of the questionnaire. It was difficult to direct the discussion to this task. However, it became apparent that, in addition to the accessibility of paths, a thematic focus of the digital walking guide will be historical and recreational walks. These can be, for example, narrated and recorded stories in walking and/or data on the nature of paths and interesting or relevant places to pass by.

Also, we wanted to discuss examples on displaying routes and related information. We had prepared a presentation on the “accessible city guide” on the official city portal as example for displaying walking routes. Again, the discussion digressed and instead centred around interesting places and their stories.

4.7.2.2 Conducting data workshop

Based on this preliminary work and workshop, we conducted seven different walks spread across the six neighbourhoods of the district.

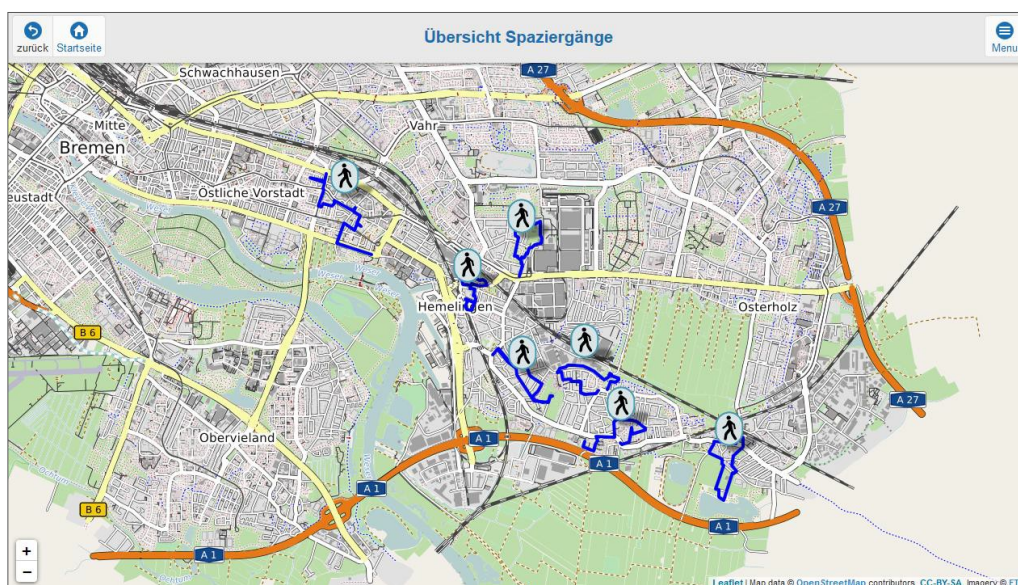


Figure 50: Zoomed out map with the paths of the neighbourhood walks.

We experimented with different types of walks and walking workshops for data collection.

Guided historical walks

We conducted two walks that were each conducted by an older resident that talked about the neighbourhoods' history. The figure below depicts Dr. Knauff, the tour guide of the walk through the neighbourhood of Hastedt.



Figure 51: Dr. Knauff showing an old photograph of the place we are visiting

Walks in parks and recreational areas

Three of the walks that are described in our service were conducted in collaboration with the senior citizen meeting place in one of the neighbourhoods. A fourth walk was conducted in collaboration with a project to increase outdoor activities of older adults.



Figure 52: Walk through one of the parks

Each walk was announced via the local newspapers, the district's website as well as the network of service providers. Each of the walks lasted between 1.5 and 2 hours. This time was proposed by the network of service providers as most suitable (also for people with mobility issues). The starting points/meeting places were well-known places in the district and accessible by public transport. Each of the walks included at least one stop for either lunch or

cake & coffee. The descriptions of the walks feature places with lunch offers for older adults and café, public toilets, etc.

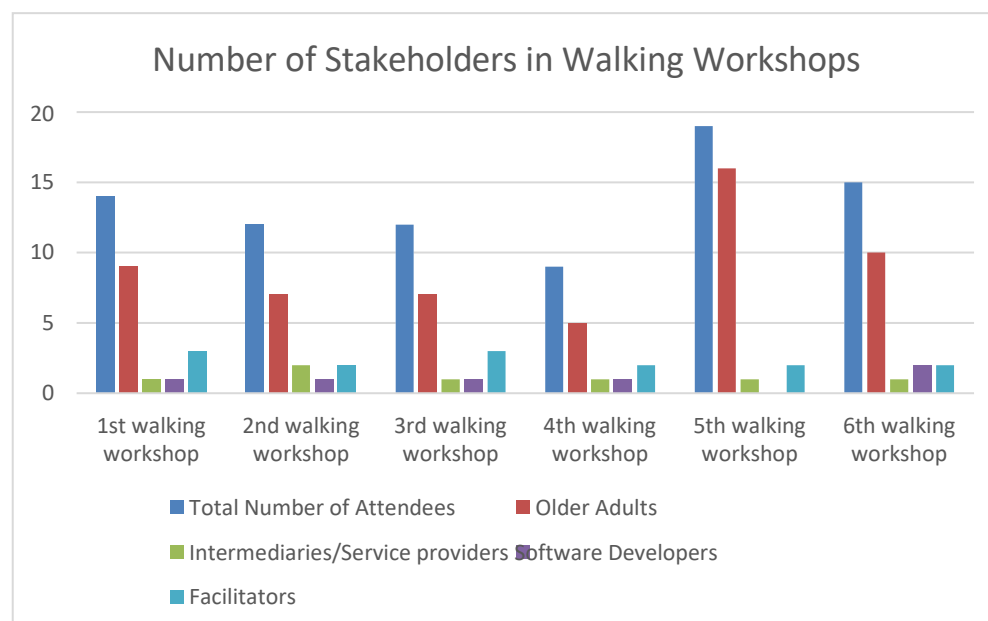


Figure 53: Number of stakeholders in walking workshops

The participants assumed different roles for the walks:

- Organiser**
 In our case the organiser was a local social care service provider (meeting place) for older adults. They published the announcement in their networks and newspapers and also organised with other service providers for visits during lunch time or for coffee & cake. The picture below is from one of the walks where no refreshment venue was close to the walk. The social activities manager from the senior citizen meeting place organised a picnic.



Figure 54: *Picnic during one of our walks*

- **Guide**
In our case, we either had knowledgeable individual who provided a guided tour on historical points of interest or knowledgeable individuals who planned a walk through parks and recreational areas.
- **Data collector**
Most participants on the walks used a clipboard to note down points of interest, issues with the infrastructure (e.g. missing benches), etc.



Figure 55: *Note-taking during our walks*

- **Data validator**
One of our participants checked the location of benches on the walks as provided by OpenStreetMap. If benches were missing on OSM, he added them; if benches were listed on OSM but not existent, they were deleted.
- **Photographer**
Overall, we had three older adults that were semi-professional photographers and supported our data collection by taking pictures. Not all pictures could be taken during one of the walk, so all of them volunteered to visit points of interest again.
- **Video**
Through our collaboration with Bremen.Online we had the opportunity to have somebody taking videos of two of the walks for further processing.

4.7.2.3 User testing

In order to review i) the functionality of the app and ii) the quality of the data we walked along one of the walks in the neighbourhood Hemelingen while using the application on tablets. We asked participants to review the functionalities, the relevance of the content and the quality of the data. At a coffee break in between and a closing lunch we discussed the feedback in the group. We observed the participants while using the app, took notes and audio-recorded the discussions.



Figure 56: Testing the app while walking

In a subsequent focus group, we asked for further feedback. It was difficult to steer the discussion on the functionalities and the data and hence to get a reliable feedback. The participants however emphasized that they were happy to see the progress of the app, the lot of contents and their own contribution to it.

4.8 Content creation workshops

Separate to the individual walks in **Bremen Hemelingen** that we conducted, ran a series of 8 content creation workshops in order to i) recruit older adults, ii) demonstrate the interest of older residents in such walks and iii) collect data (actually producing digital content for our digital district guide). These content creation workshops were supported by accompanying tablet support groups for those older adults which were not familiar with digital technologies.

Overall we conducted 11 workshops dedicated to either content co-creation (8) or software co-creation (3). We called them all “tablet workshops” as we were working with the tablets and it did not matter to the participants to distinguish between the two types of activities. Figure 57 shows the attendance of older adults in these “tablet workshops”.

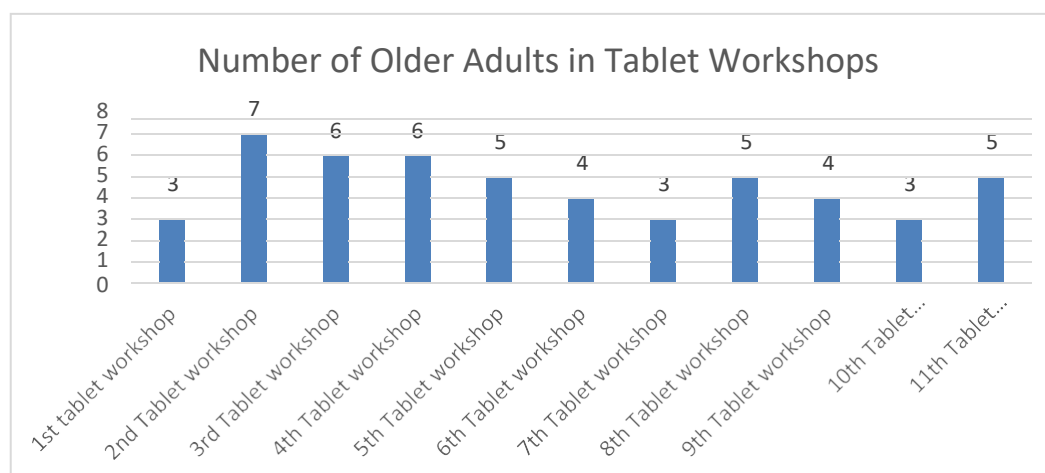


Figure 57: Number of older adults in tablet workshops

Using a content management system

Our core group consisted of 5 men and 2 women with varying technology skills and knowledge about the district. In those workshops (and the times between meetings), participants described the walks according to the attributes/templates defined under the service concept. Participants had access to a tailor-made back-end in order to provide these descriptions and information to the system.

After the very rudimentary and pragmatic data creation support in the first phase, a more user-friendly backend for the second phase was desired. For the second phase, a content management system (CMS) handled the data co-creation of the participants. CMS “Kirby”⁷ was chosen. Kirby is very lightweight, user friendly and highly flexible. It works without an external database and stores all data in the file system, so the system requirements are quite low.⁸

A location database was manually initialised with the data provided by the printed “Stadtteilplan für ältere Menschen – Hemelingen” and then maintained and improved by the participants of the co-creation workshops.

⁷ <https://getkirby.com/>

⁸ As the system is implemented in PHP, it can be run and accessed in a platform container and provide the data service from there.

The screenshot displays a web-based data management interface for walks. The top navigation bar includes links for 'Übersicht', 'Hemelingen', 'Daten', 'Spaziergänge', and 'Rund ums Bürgerhaus'. The left sidebar shows 'Seiteneinstellungen' with options for 'Seite öffnen' and 'Status: sichtbar', and a 'Dateien' section with a list of image files. The main content area is divided into two sections: '01 Basisdaten' and '02 nächster Termin'. In '01 Basisdaten', there is a 'Titel' field with the value 'Rund ums Bürgerhaus', a 'Datensatz-Besitzer' dropdown set to 'reins', a 'Vorschautext' field with the text 'Spaziergang durch die Mitte des Ortsteils Hemelingen', a 'VorschauBild' field with a selected image, and a 'Kategorie' section with checkboxes for 'Naherholung' (checked) and 'Historisch'. The '02 nächster Termin' section includes a table for 'nächster Spaziergang' with columns for date and time, and a text area for 'Informationen zum Termin' containing details about a future walk. At the bottom, there are fields for 'Anmeldung bei' (Karin Schüdde) and 'E-Mail' (begegnung1), along with a 'Telefon' field and a 'Speichern' button.

Figure 58: Screenshot of the data backend for a walk

Creating screenplays and producing multimedia slideshows

In addition, participants produced short videos about the walks in order to raise interest in the walks. Originally we had thought that the information gathered on the walks and from participants could easily be used for video and audio clips attached to each walk. But participants had difficulties to do so from a user-perspective. In order to enable participants to shift their perspective from reporting an own experience to creating motivating videos that make other people feel like wanting to experience the walks, we recognized the need to develop scripts for multimedia screenplays, storylines of what the highlights of the walks are, and a corresponding video sequence and corresponding comments on the voice track. This did not only require a new conceptual perspective but also different software tools for slide show creation. We used a video editing app on the tablets.

Most videos are slideshows of photographs and include a spoken text by participants. The reasons for producing videos were i) to create content for the digital neighbourhood guide, ii) to expose participants to (new) software, and iii) to allow older adults who do not feel comfortable in writing long texts to contribute with spoken words. As we had experienced in Osterholz that not all participants felt comfortable and competent to write. Others did not feel competent to create slide shows on the tablets. Here the different participants with their respective skills could take different roles and complete different tasks according to their competencies and interests. This was considered a more inclusive practice. For parts of the descriptions, where we did not have written text, we used transcripts of the videos.

The picture below shows a participant checking the route on a printed map while working on the slide show, confirming where the picture on his tablet was taken.



Figure 59: Producing a slideshow while checking the route

Detailed information about a walk

The detailed information page about a walk displays all relevant information stored for the walk. The information about walks contains:

- The title of the walk.
- A short description.
- The length of the walk.
- The estimated duration.
- A small image for decoration.
- A long description of the walk.
- A video clip if available.
- An image gallery with a list of previews of all available photos.
- Information on availability of toilets, benches, street lightning and hospitality services along the route.

Detailed information about a location

In addition to information about the walks, participants also produced information about points of interest. The information about a location contains:

- The title of the location.
- A short description.
- The relevant categories of the location.
- A long description of the location.
- The address of the location if available or a description of where to find the place, if the place is a bigger area.
- A video clip, if available.

- An image gallery with a list of previews of all available photos.
- Keywords that give a brief description of the available offers and services.
- Information on how to get to the location by public transport.
- Information about the accessibility of the location.
- Further important information.
- A block of contact information, like contact person, telephone number, email, homepage, sponsorship/owner and opening hours.

4.9 Data tables

Another method that was used for the co-creation of content in Mobile Age were data tables. They played an important role in Bremen's first co-creation process in **Bremen Osterholz** where the first digital neighbourhood guide was developed. In a number of workshops dedicated to the development of ideas and defining a service we had selected categories of objects to be displayed on a map as well as relevant attributes for each of these categories. According to the selection of categories and attributes, we decided to differentiate between two main kinds of objects, with differing attributes:

- **Nice places and walks**, with descriptions about what was considered to be particularly nice, and information about the availability of benches and toilets nearby as well as supplementary information on possibilities for e.g. exercising or BBQs.
- **Informal meeting facilities, institutions and services** in the field of **culture, consultancy and advice as well as sports** with data on the individual services and facilities, events, contact person etc.

For each object, we created a matrix with a line for each object and several columns for the different attributes. These **two data tables became the central working tool for the data collection and co-creation process** with two objectives:

- **Completeness**, e.g. identify all the relevant objects in Osterholz for each category.
- **Richness of relevant details**, e.g. to collect data on as many aspects as possible for each object.

Through a number of iterations we gradually completed the tables. In addition, a main task for the researchers was to standardise the data, i.e. to find the right format to describe different kinds of objects. This format also had to comply with the data structure of the city information provider (Bremen.Online) as they are envisaged to sustainably maintain the final product (see also D5.3).

Below are three figures (60-63) that illustrate the progress of completing the data tables throughout the co-creation process. There is a line for each object (place or facility) and the columns contain relevant attributes, e.g. name, address, description, offerings, transport, contact, and website etc. Altogether, 19 nice places and walks and more than 70 institutions and services were identified, but there was little precision on attributes. All in all, the project team conducted 12 focus groups (e.g. men's breakfast, pottery groups) with more than 80 older citizens, where the participants named places they considered to be nice and places where they meet other people as well as institutions offering different kinds of services relevant to them. The interviewers used a structured guide with different categories (to the ones selected within our Mobile-Age core group, for example, including commercial cafes and

restaurants). Members of the group named places and interviewers asked what was nice about a particular place, others then added different aspects.



Figure 60: Picture of one of the focus groups displaying some of the relevant artefacts

Most of the focus groups were conducted with people that had lived in Osterholz for a long time. People were deeply rooted in the district and had a vast knowledge about the history of the district, interesting places and events. Some participants were very active themselves in organising meetings, gatherings and other informal social events. The discussions were usually very fruitful as groups were very engaged and had many stories to tell about the district as well as lots of practical information on places and events. Important artefacts to facilitate the focus groups were older citizen neighbourhood guides of other districts, a map of the neighbourhood to be discussed as well as a template table in which information about the neighbourhood is noted.

Information on attributes largely came from the printed neighbourhood guide. But this guide did not cover all the objects proposed and not all desired attributes. Therefore, the first tables contained several blank fields due to participants contributing limited information, in some instances.

Figure 61: First data table with "our" attributes

Because of these gaps, it was also important to recruit knowledgeable people (beyond our core group) for data collection and for supporting the drafting and editing of the data collected on nice places and walks. In our "collaboration meetings" with local stakeholders we presented our "data tables" and discussed either possible collaborations or received input on specific categories/objects. We met with three members of the "men's breakfast group" (a

group of mostly older men meeting for breakfast and discussing issues in the district on a monthly basis); a member of the BORIS editorial team, a member of a group concerned with the district's history, one representative of a church congregation and the neighbourhood manager of "Schweizer Viertel". They provided useful information on differing aspects on nice places and walks which were noted by researchers.

This complementary task was important as it was relatively easy to get people to name nice places and give a few keywords to describe it. It was however, harder to get information on a pre-defined set of attributes, and even more difficult to get this completed for all the points. A major challenge was to find people who could take over editorial tasks and write clear and relevant texts based on the initial sets of keywords collected through the focus group (as described above). Yet this was important for future users of our Mobile Age neighbourhood guide.

Figure 62 shows the progress as we proceeded with the data validation. Throughout it was important to provide informants and co-creators with printed tables as they were not always prepared to work in a digital file.

Figure 62: Slowly completing the data tables

While information on attributes such as address, contact, and website was evident and easy to collect, the description was the most difficult one. The purpose of the description is to communicate why a place is nice or a facility of interest to older people. For the description our core group participants mainly had contributed keywords. The ifib team wrote complete sentences and a coherent structure of the description. For a few nice places, a member of the BORIS team, who had not participated in the core group delivered texts based on the keywords from our participants. Another member of the BORIS team, also engaged in a history workshop for the district, checked and amended the texts edited by the ifib team. Finally, the largely completed tables were transformed into digital data tables by FTB and used as input for the data base, which was made accessible to our participants who added further information, e.g. keywords, and uploaded photos. In order to acquire this information, participants assumed responsibility for particular objects (e.g. places), validated the information (e.g. through going there) and creating data (e.g. photographs).

Bearbeiten	Name	PLZ	Ortsteil	Adresse	Veranstaltungsort	Erreichbarkeit	Öffnungszeiten	Longitude	Latitude	BO Id	Träger Name	Kontakt Name	Telefon	Fax	Email	Web	Beschreibung	Schlagworte	Logo	Quelle	Verantwortlich	Int. Kommentar	Bearbeiten	Löschen
Bearbeiten	AMEB Begegnungsstätte am Siek	28325		Am Siek 43			Büro: Dienstag 14.00 Uhr bis 17.00 Uhr, Mittwoch 9.30 Uhr bis 13.00 Uhr	8 94326 53 06322 30195488	AWO	0421 - 42 07 50	Marina Neves Da Silve	ameb_08@web.de					Die Begegnungsstätte ist ein Nachbarschaftstreff mit Tradition. Angebot Jeden Dienstag von 15 bis 17 Uhr ist Programmtag mit Kaffee und Kuchen. Hier kümmern sich ehrenamtliche Helferinnen und Helfer um die Besucher. Es gibt ein wechselndes Programm aus Vorträgen, Quiz oder Bingo, Gedächtnistraining oder auch gemeinsames Essen oder Feiern. An anderen Tagen finden Gymnastikkurse oder Volkstanz statt. Es gibt eine Skatgruppe und eine Gruppe, die Brett- und Würfelspiele macht.	Begegnungsstätte Essen Feiern Gedächtnistraining Gymnastik Kaffee und Kuchen Lesungen Nachbarschaftstreff Spielen Treffpunkt Vorträge		Stadtleitender, Gruppen von Frau Hilmann			Bearbeiten	Löschen
Bearbeiten	AMEB Begegnungsstätte Sudwalder Straße	28307		Sudwalder Straße 51			Mo. 08.30 - 12.00 Uhr Di., Mi., Do. 13.30 - 17.00 Uhr Fr. 13.30 - 17.00 Uhr	8 95243 53 05466	AWO	0421 - 40 39 56	ameb-sudwalder@web.de						Die Begegnungsstätte ist ein Nachbarschaftstreff Angebot Wöchentlich u. a. Aktiv im Alter (Damen- und Herren-Gymnastik), PC-Kurse, Malkurse, Yoga, Spielnachmittage, monatlich u. a. Kulturelle Veranstaltungen Stadtleitungen Informationsveranstaltungen, offener PC-Treff, Gedächtnistraining und anderes zu Gesundheits Themen.	Begegnungsstätte Gedächtnistraining Gesundheitsthemen Gymnastik Informationsveranstaltungen Malkurse Nachbarschaftstreff PC-Kurse PC-Treff Spielen Stadtleitungen Treffpunkt Yoga		Stadtleitender, Gruppen von Frau Hilmann			Bearbeiten	Löschen
Bearbeiten	Nachbarschaftstreff	28325						8 9631			Silvia Suchan						Der Nachbarschaftstreff	Nachbarschaftstreff		Stadtleitender			Bearbeiten	Löschen

Figure 63: Data table online in Mobile-Age app

4.10 Digital prototyping and editorial work

The following account is an example from Bremen Osterholz on the prototyping activities that were conducted in all field sites.

Map design workshop

A parallel line of activity concerned the design and visualisation of the map. In order to discuss the design of the digital map to be used for the Mobile Age neighbourhood guide, we conducted a workshop dedicated to map design. This included a presentation of different kinds of maps as well as an individual task for participants to navigate three different map applications (Google, Bing, OSM) and search for a point of interest. This was an ideal way for participants to experience a variety of existing services. Below is a screenshot of the three different maps

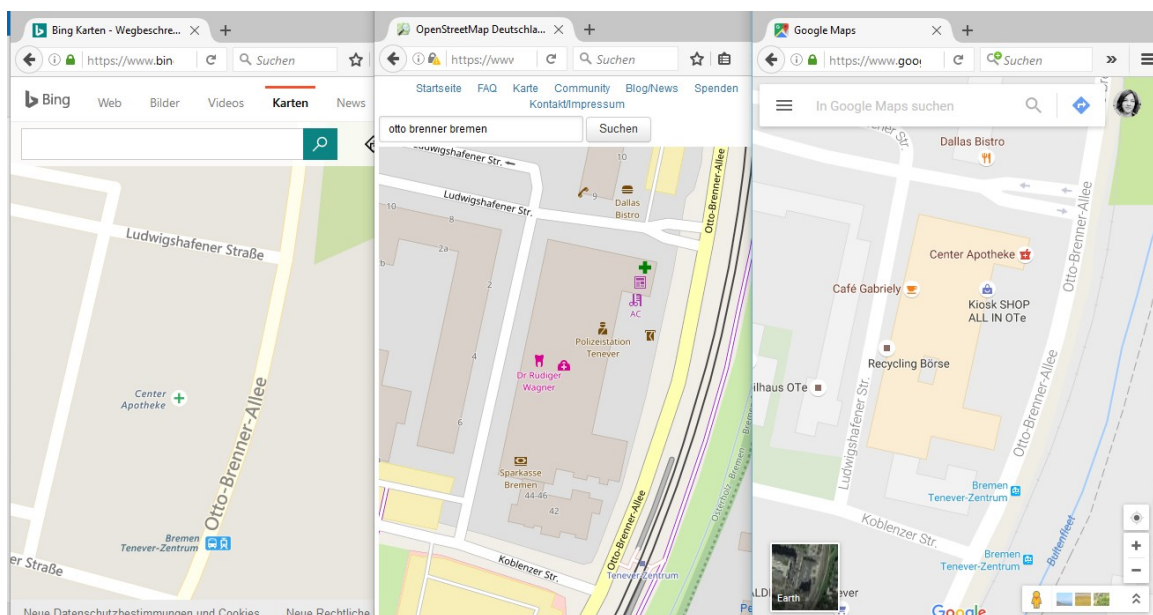


Figure 64: Visualisations/maps of the same part of Osterholz with different map designs and different objects visible (Bing, OpenStreetMap and Google Maps)

After the hands-on exercise, we discussed the different aspects of the maps like contrasts, content density and content presentation. The participants were told not to argue just from their perspective but also from the predefined personas perspective.

In this case it was very important to remind the participants that it was not about which map was the “prettiest” but to draw the participants attention to aspects of usability, accessibility and user experience. The personas helped the participants to focus on practical decisions. The participants found the following aspects positive, in particular with respect to orientation:

- Outlines of all buildings like on OpenStreetMap
(Google maps does not show all buildings and uses a very low contrast (1.1:1); Bing maps does not show any buildings).
- House numbers of the buildings like on OpenStreetMap
(Google maps and Bing maps do not show house numbers.)
- Landmarks such as bus stops, pharmacies or other well-known locations that support orientation

Subsequently Mobile Age developers presented a demonstration of the map they had developed and which was based on the experiences of their former work with older citizens and physically impaired people. The map was characterised by using high contrast for textual information such as street names, names of districts as well as street- and building outlines. The further development and refinement of the Bremen app carried on by integrating the insights from the demonstration exercise. Figure 65 below provides an overview of some of the features that are improved in the Mobile Age map.

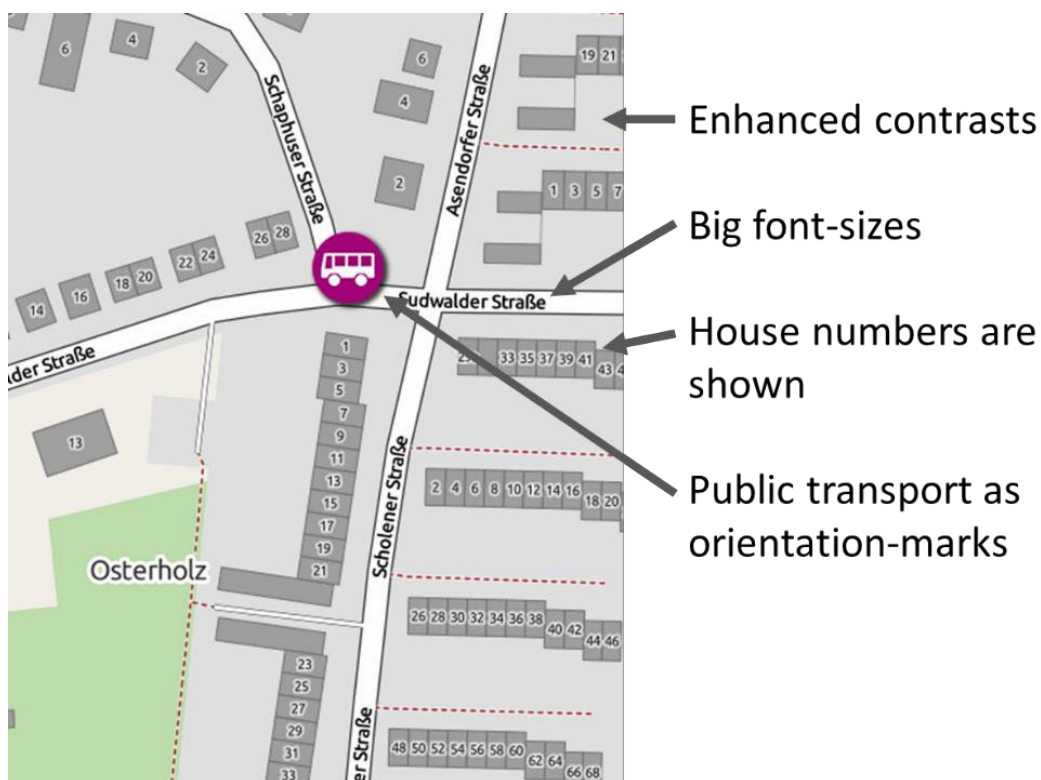


Figure 65: Mobile-Age map for older citizens with improved features

One of the ifib researchers suggested the option of filters: In order to provide more information, that could be shown or hidden depending on specific filters. The participants considered this aspect very helpful. In the following, FTB researchers demonstrated how objects could be visualised in the map using benches and toilets as examples. Below we show the final result.

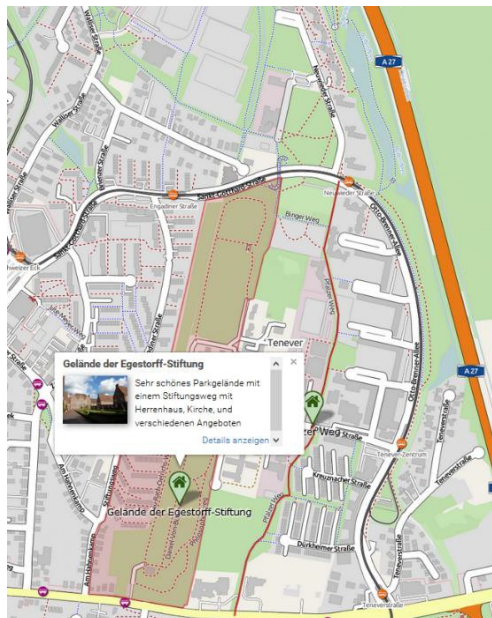


Figure 66: Final map design featuring bus stops as orientation points



Figure 67: Final map visualisation featuring toilets and benches

Subsequently, we conducted **four digital design workshops** along with activities related to **editorial data work**. In the workshops we aimed to (1) demonstrate and discuss the welcome page, (2) discuss the experiences with tables and prototype, and (3) validate information. This was accomplished through a mix of presentations, group work and group discussions.

Welcome page

As for example, for the welcome page, participants favoured tiles. FTB developers demonstrated a number of visualisation options and all came to an agreement.

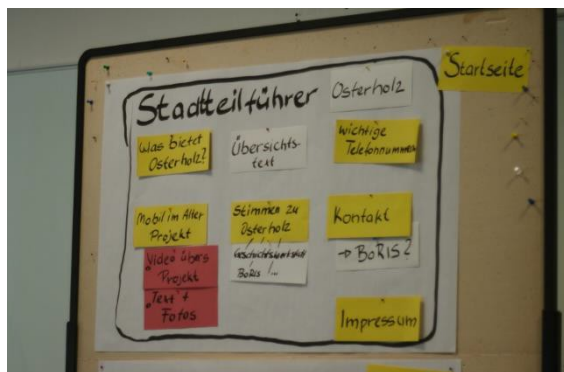


Figure 68: Collection of ideas about start page of Mobile-Age app

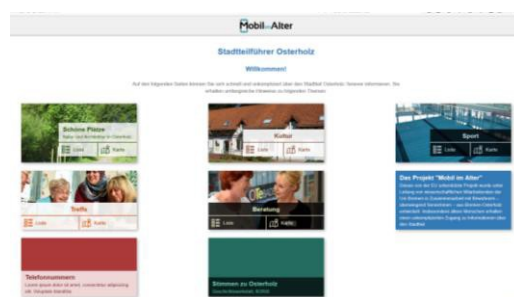


Figure 69: Digital translation of start page discussion

The agreement was reached on basis of the following criteria:

- The design was based on the official Bremen.Online page for the district

- Single tiles for each category of attributes in the map (nice places, meeting places, cultural offers, sport offers, counselling)
- Further tiles for project description, telephone numbers and links to other district related websites (“Voices from Osterholz”)
- Because of accessibility and usability no additional text for the different tiles, only headline

In the discussion on how much information each tile should contain the seniors agreed, that they did not want too much text. One group worked on a welcome text/note. One important point of discussion was the question which term they wanted to use to describe the target audience (older citizens) of the web page. Some participants did not want to name the target group at all, but then agreed with the researchers that it should be clear who is addressed. One participant proposed the German term “Menschen im fortgeschrittenen Alter” (people in advanced age), but another participant preferred the term “seniors” and another one said, that he does not care at all, what term we choose. It was a very lively discussion and at the end we decided to use the term “older adults”.

List or/and map?

We had a long conversation over several workshops as to whether the results should be visualised on a map or in a list as a first output. Below are the two examples from the paper prototype session. Finally, we agreed to list all 5 object categories on the start page of our project and provide the users with the possibility to select either a list or map representation (picture on the right hand side).

Oberfläche 2 – Liste oder Karte?



Figure 70: Paper prototypes - visualising maps or lists

Figure 71: Start page tiles



List

The list view was implemented according to the ideas of the senior participants.



Figure 72: Paper prototype list

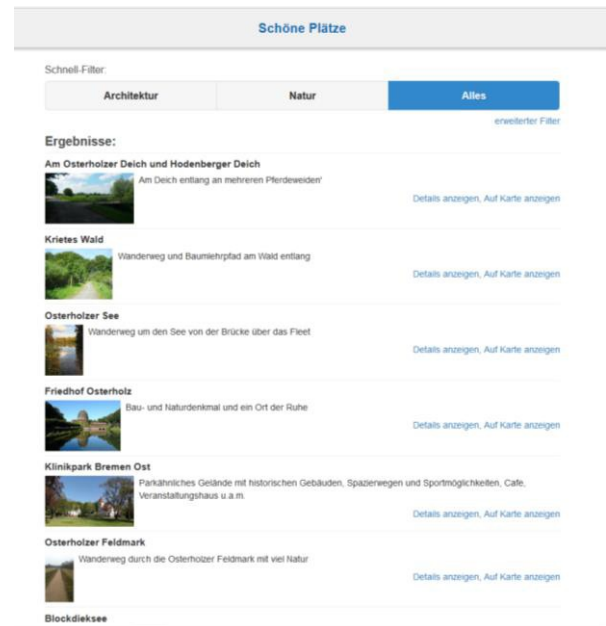


Figure 73: List first digital demo

Map

In contrast to the paper prototype, participants decided on the necessity to visualise the boundaries of “places to go” or walks. This has been implemented in the digital prototype as shown below.

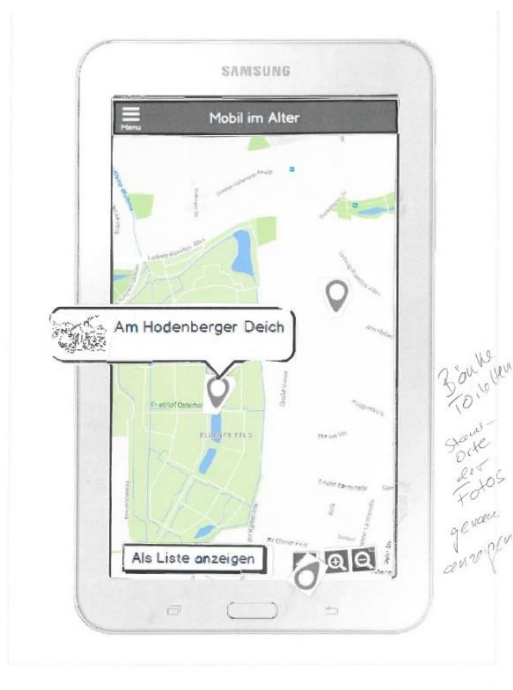


Figure 74: Paper prototype preview on map

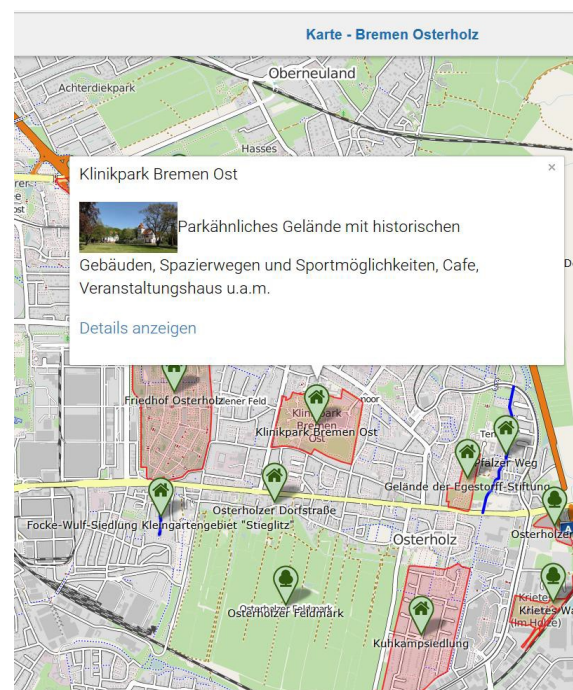


Figure 75: Preview on map - prototype

Toilets and benches

Toilets and benches were not only considered as attributes of places but also as standalone categories. All of them should be visible on the map in relation to the location of the user, in order for the user to find the nearest one.

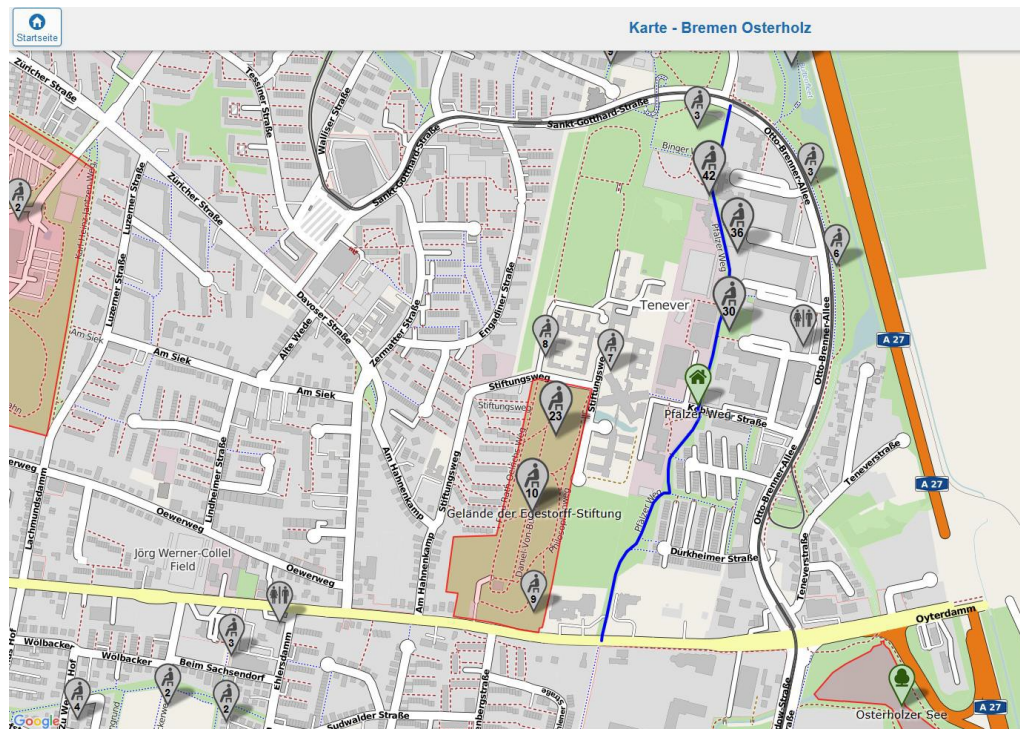


Figure 76: Display of benches and toilets (clustered)

4.11 Co-creation workshops

In total there were 26 co-creation workshops conducted in the South Lakeland field site. In contrast to the methodology employed in Bremen, where there were different types of workshops around activities such as walking, content creation and data, the workshops in South Lakeland followed just one format. They were centred on group discussions combined with activity sheets and cards (described earlier in this section), as well as techniques such as brainstorming to generate ideas and make decisions on the different aspects of the planning, design, development and deployment of the digital services and apps being co-created.



Figure 77: Co-creators during workshop 18

The co-creation process adopted followed a cycle of divergence and convergence. This applied both to individual workshops and to the co-creation process as a whole. The divergent stages involved exploring issues, imagining possibilities and generating ideas and solutions. During the convergent stages, we then worked on those ideas, organising, categorising, prioritising and then selecting the best or most appropriate.

The timeline below shows the workshops conducted in South Lakeland:

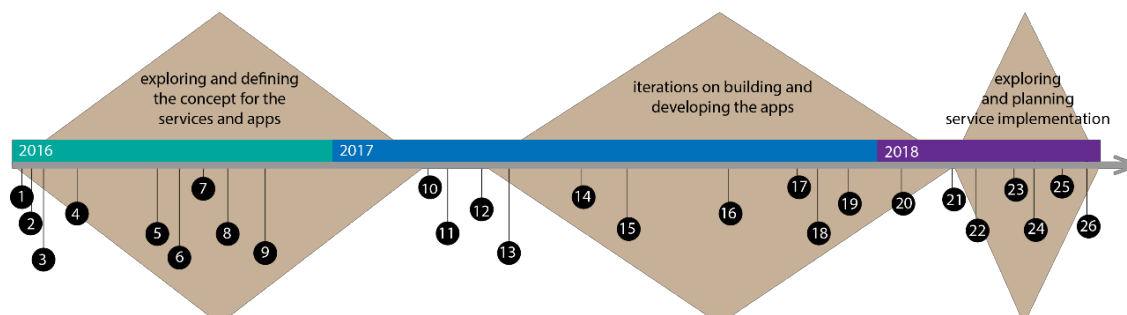


Figure 78: timeline of the co-creation workshops in South Lakeland

The first diamond corresponds approximately to phase 1 of the co-creation process. During this phase, the initial workshops explored the issues surrounding loneliness and social isolation, and started defining the focus and context of the service and apps to be co-created. In subsequent workshops prototypes started to be developed, first paper prototypes and later digital ones.

The prototypes defined the direction of the development work and on phase 2. The apps were refined and completed through an iterative process. Workshops focused on different parts of the apps and part-by-part interfaces and functionality were improved. For example, the photo above shows the group of co-creator working on the user profile. During workshops 18 we discussed the possible types of information that could be contained in the profile and decided together which ones were more important and should be included. On

the following workshop (19) we discussed the implications of having information recorded in a user profile and decided what level of data input the apps would require users to make.

Once the apps were developed and open data sources defined and incorporated and we had a working demonstrator, attention turned to the implementation of the apps within the local area. Issues of use came to light during the digital cultural probe experiment and a final set of workshops were added to discuss and imagine possible ways of implementing services using the apps.

4.12 Discussion: The role of older citizens in co-creation

The initial questions to this chapter were:

1. How can older adults engage in civic open data use?
2. How can older adults become co-creators of digital public services?
3. What roles may older adults assume in co-creation and what methods may facilitate a role-shift from user to co-creator?

4.12.1 How can older adults engage in civic open data use

There is a tension between data-driven app development and citizen-driven service co-creation as much of the information identified as relevant in co-creation processes is not available as open data. We are convinced that effective and relevant services for older adults should not be driven by what data is available, but rather have to be based on the needs and requirements of the target audience.

The data workshops as conducted in Zaragoza and Bremen provided a suitable way for older adults to become engaged with data and co-create their own data. Overall, the data workshops conducted in Mobile Age may have had similar formats, yet their goals and the roles that participants assumed differed.

Table 10: Comparing different types of walking workshops in Mobile Age

	<i>Bremen Hemelingen</i>	<i>Bremen Hemelingen</i>	<i>Zaragoza</i>	<i>Bremen Hemelingen</i>	<i>Zaragoza</i>
Type of workshop	Ideation walk	Data walks	Data walks	Technology walk	Digital data walk
Occurrence during project	1	6	3 x 3 (3 in each of the 3 districts)	2	1 x 3 (1 in each district)
Goals	Defining relevant categories/ information needs	Collect data on pre-defined categories	Collect data on pre-defined categories & refining categories	User testing of the new app	Validate data in collaborative maps
Number of participants	5	between 5 and 20 (usually with 5 active members)	6	3-4	6
Type of participants	Older adults & service provider	Older adults & service provider	Older adults	Older adults	Older adults
Roles of participants	Explorer Idea former	Navigator Photographer Note-taker	Navigator Photographer Note-taker	User Tester	User Tester
Duration	60 minutes	60 – 90 minutes	60 – 90 minutes	60 minutes	90 minutes
Duration of event	~ 2 hours	~ 2 hours	~ 2 hours	~ 2 hours	~ 2 hours
Event makeup	Walk-discussion	Walk-break (coffee/lunch)-walk	Walk - discussion	Walk - debriefing	Walk - discussion
Outcome	Initial list of information needs	Written responses on walks	Data on walks to be uploaded to collaborative maps	List of technical issues	Validated data on collaborative maps

Participants in those walking workshops assumed a number of different roles, from explorer (what kind of walks should be worked on), to idea former (what kind of information may be of interest to others), to data creators and validators, users and testers of digital apps.

Walking is an everyday activity that is very suitable in a number of ways. The walks encouraged the participants to be active outdoors and helped to describe the neighbourhood. Furthermore, we experienced that these walks can contribute to the improvement of the physical infrastructure neighbourhoods; On the walks a central topic that the participants discussed were issues of age-friendliness of the infrastructure. Since we recorded the discussion on the walks, we had unintentionally collected valuable data on problems in the physical infrastructure. The district council showed interest in these data and we were invited to present them at one of their meetings. In so far the project contributes to the objectives set out by the WHO Global Network of Age-friendly Cities and Communities (GNAFCC) (see chapter 3.3).

4.12.2 How can older adults become co-creators of digital public services?

Older adults in a co-creation process come with very different capabilities, motivations and digital skills. For example, some older adults joined the co-creation processes in order to get (more) acquainted with digital technologies others were very expert already. From the process in Bremen Osterholz, we learned that there should be more explicit support. We considered this in the process Bremen Hemelingen and learned that such a support needs to be better tailored to the individual needs of different participants.

In this chapter we are discussing how older adults were enabled in the Mobile Age co-creation process to share their tacit and explicit knowledge. Although we have used a number of different methods that facilitate the sharing of tacit knowledge and act as boundary objects (see also chapter 1.8.4), we are here focusing on (cultural) probes (for an intro see chapter 4.5).

As argued earlier, it is important to establish older adults as experts in a co-creation process in order to level out some of the power imbalances that are present in any collaboration project. The walks and walking workshops were an ideal format in which participants could demonstrate their local knowledge and expertise. They were particularly helpful for prompting participants to speak about certain places, streets, etc.; something that was at times more difficult for our participants in Bremen Osterholz, when they had to report on nice places in a closed workshop environment. In addition, some participants had above average technical expertise, e.g. on Open Street Map or video editing.

In order to establish older adults as experts the different kinds of experience and expertise that different people have, need to be addressed and appreciated equally.

Above we have argued that co-creation projects need to take a **practice-based and situated approach**. In such a framework **older adults, intermediaries and service providers are inevitably the experts over the practices of their everyday life** (older adults) and practices of service/care provision to and engagement with older adults (intermediaries and service providers). In both field sites, the **cultural probes** (also through the interviews and the workshop) **provided an opportunity to establish the senior participants as experts of their life course** and of experiencing the process of becoming older/ageing. The probes facilitate the understanding of everyday life and practices related to ageing, technology use, and the appropriation of the district when becoming older. Since the probes affirmed the researchers' sincere interest in the participants' lives, we could demonstrate our appreciation towards the participants with well-designed probes and build trust relationship. Key to the trust building

were also the individual interviews. In South Lakeland, Probes also facilitated the collection and validation of data and the testing of software.

What this demonstrates is, how co-design methods such as probes, which were originally developed as creative triggers for designers, can be transformed in participatory tools. It is important to consider how such a translation subsequently enables participants to assume new roles and facilitates their role-shift (e.g. by establishing them as experts).






However, in Bremen Osterholz we experienced that participants found it difficult to shift between different roles and tasks throughout the co-creation process. For Hemelingen, we proposed to identify interests and abilities of the participating older adults, and include them accordingly. For example, we included some older adults only in a few focus groups because they would not commit to a long process. However, some participants experienced this fragmentary user participation as dissatisfactory as the vision and idea for the service had to be continuously negotiated throughout the process as participants joined and left the process. We therefore assume that a core group of older adults as co-creators is still the most suitable form.




Consider a core group of older adults as co-creators that engage over the entire process and where each participant contributes to different tasks that fit her/his interests and abilities and are defined jointly in the beginning. From the start, facilitators should announce that they will engage additional co-creators when there is consent that certain additional input or expertise are required.

4.12.3 What roles may older adults assume in co-creation and what methods may facilitate a role-shift from user to co-creator?

In the table below, we provide a summary of the roles that older adults assumed across the five co-creation processes. Only in Bremen Osterholz did older adults become facilitators (e.g. by recruiting other participants). In almost all field sites older adults became explorers, idea formers, designers and data curators. These are the roles responsible for the core-co-creation activities within the development process itself. In the provision and diffusion of the services, the involvement of the target user group again decreases. Apparently management and organisation related roles and tasks are not the ones assumed by older adults primarily (even if there might be a few highly committed older adults assuming a high degree of responsibility). Here the involvement of other stakeholder groups such as intermediaries, service providers or local government staff is required. Older adults however assume a variety of roles concerned with the core-co-creation activities. Since the development process itself is the part of the co-creation process, where it really makes a difference *who* is co-creating, the involvement of the target user group in these stages is crucial. Regarding the political efforts to hand over responsibility not only for the co-creation of services but also for their provision, older adults do not seem to be the appropriate target group.

D1.5 Final study on co-creation practices

Field Site		Bremen Osterholz	Bremen Hemelingen	South Lakeland	Zaragoza	Thessaloniki
Plan	 Facilitator	Engaging stakeholders (support recruitment by promoting the project)	No	no	No	No
Build	 Explorer	Co-creating a service concept (explore information needs with cultural probes, interviews, personas)	Co-creating a service concept (explore information needs via focus groups)	Co-creating a service concept (understanding older adults practices through observation, interviews, focus groups, probes, personas and other workshop activities)	Explore main information needs older adults about their frequent routes (forms) Define routes	Explore main information needs older adults regarding health issues (questionnaires) Define data
	 Idea former	Co-creating a service concept (defining and selecting functionalities and attributes from self-defined and pre-defined alternatives)	Co-creating a service concept (refining a pre-defined service concept in focus groups and walking workshops)	Co-creating a service concept (generating ideas through co-creation workshops about what should be included on the service/app)	Co-creating a service concept (defining and selecting content (routes) and attributes from self-defined alternatives) Identifying relevant data	Co-creating a service concept (selection from pre-defined service concepts/functionalities and suggest supplementary services)
	 Designer	Co-creating software (implementing interface designs with scenarios and digital prototyping and paper mock-ups)	Co-creating software (refining pre-defined interface paper mock-ups)	Co-creating software (deciding and defining interface and functions of the app through workshop activities including paper prototype, digital prototype and user testing)	No	Co-creating software (refining pre-defined interface mock-ups)
	 Data provider/curator/creator	Identifying and completing existing data and co-creating unavailable data sets	Identifying and completing existing data and co-creating multimedia content Feed in collected data in the backend of the prototype	Identifying existing data and co-creating visual content (photos of posters)	Co-creating data on selected attributes (route details) Complementing and validating data	No

Run	 User of service/app	Testing and evaluating the service/app (test use via tablets, questionnaires)	Testing and evaluating the service/app (test use, questionnaires)	Testing and evaluating the service/app (test use via tablets and questionnaires)	Evaluating the use (log file statistics)	Testing and evaluating the application's user interface with tablets
	 Provider of service/app	Maintaining data on nice places and walks	No	no	No	No
	 Diffuser	Promoting the app via newspaper and presentations on events	Promoting the app via presentations in tablet/pc groups for senior citizens	Co-creating dissemination and service implementation ideas (co-creating scenarios of use of the app/service) Plans to be involved in peer-to-peer support and training and presentation to local older adult groups	Promoting the app via newspaper	No

5 Process: Co-creating sustainable digital public services

If we take the involvement of citizens in the co-creation of a service serious, it means that the initiators of such a process need to share the control over its procession with the stakeholders involved. In the following, we will reflect on in how far and with what means we were able to open up the process to different stakeholder groups. We will do this with particular focus on the question of diversity as well the different structures of project governance across our five pilot studies.

5.1 Openness and diversity of the co-creation process to a variety of stakeholders

The initial tasks for the activities relating to the engagement of stakeholders are the setting-up of a core project group, and to ensure access to older citizens. Recruiting people for the duration of a co-creation process with open objectives and tasks unfamiliar to most older adults is a great challenge.

Across all field sites, the recruitment strategy for older adults considered the different requirements and emphasised that digital skills were welcome but no precondition. For example, given the focus on ageing in place in Bremen and Zaragoza it was important to engage older adults with good local knowledge. In addition, all field sites recruited local social care service providers to support either participants' abilities and contributions.

Table 11: Overview of involved older adults and intermediaries per field site

Bremen Osterholz	Bremen Hemelingen	South Lakeland	Zaragoza	Thessaloniki
<p>16 regular workshops with a core-group of 11 older adults for a duration of 10 month (7 females and 5 males aged 55-80). Also some workshops included intermediaries, service providers and local government.</p> <p>12 additional focus groups with senior citizens groups (more than 80 female and male participants)</p> <p>8 interviews with intermediaries</p> <p>10 meetings with local stakeholders (the head of local district government, 3 neighbourhood managers, 2 representatives from two different Christian congregations, 1 social service centre, 1 representative from the centre for migrants and intercultural studies, 2 representatives from two social welfare organisations)</p>	<p>8 regular meetings with the core project group consisting of 7 service providers and intermediaries</p> <p>2 rounds of initial focus groups with three different groups of older adults</p> <p>7 Walking workshop with different older adults and service providers</p> <p>11 Tablet workshops with a core group of 5 older adults</p> <p>Project blog</p>	<p>22 Workshops attended by 15 older adults including a core-group of 7 older adults that participated of most workshops for 23 months (2 males and 5 females). Also some workshops included intermediaries, service providers and local government.</p> <p>35 Interviews and 18 casual chats (exploitation and recruitment) including older adults, service providers, local government and intermediaries</p> <p>17 Stakeholders Meetings</p> <p>6 Focus groups with older adults and intermediaries</p>	<p>3 rounds of workshops with 6 sessions each in three different districts and three different groups:</p> <p>A core-group of 6 older adults (4 males and 2 females aged 65-80)</p> <p>A core-group of 8 older adults (4 males and 4 females aged 65-76)</p> <p>A core-group of 8 older adults (5 males and 3 females aged 67-87)</p>	<p>2 information events (with 17 participants and 13 participants, 3 out of 4 participants were women and 92% of them were above 65 years old)</p> <p>3 Co-Creation Workshops</p>

However, the co-creation processes conducted in Mobile Age differed with respect to their definition of the intended targeted audiences. There were two different approaches that can be observed in our field sites:

- 1) **Open recruitment** (Bremen, RCM, SL): In these cases the participants of the co-creation processes were, to some extent, self-selecting. They either heard about the

projects from local service providers and intermediaries (e.g. via leaflets), through newspaper articles or through acquaintances.

- 2) **Targeted recruitment:** In Zaragoza, the collaborating senior citizen centres pre-selected six senior citizens per district based on a number of categories as defined by the core project group. These categories assembled the main differences within the target group of older adults, that needed to be consulted (e.g. with respect to limited mobility, digital skills).

In Zaragoza, the target audience of the app was defined through the categories chosen by the core project group. The individuals participating in the co-creation process were hence always also representing certain parts of the senior population. In contrast, in Bremen, the participants themselves defined what characteristics made a difference with respect to experiencing ageing in their neighbourhoods. Based on these characteristics we jointly developed personas and scenarios. The target audience of the co-creation process in Bremen became hence refined as part of the co-creation process and through continuous engagement with participating older adults and intermediaries.

The refinement of the target audience has implications on the refining of the problem focus and the subsequent development of a service idea. Overall, these approaches make a difference to how future users of the digital service come to be scripted. For example, in the case of Bremen, the primary target audience came to be refined as those older adults living in the district who are still relatively mobile and independent.

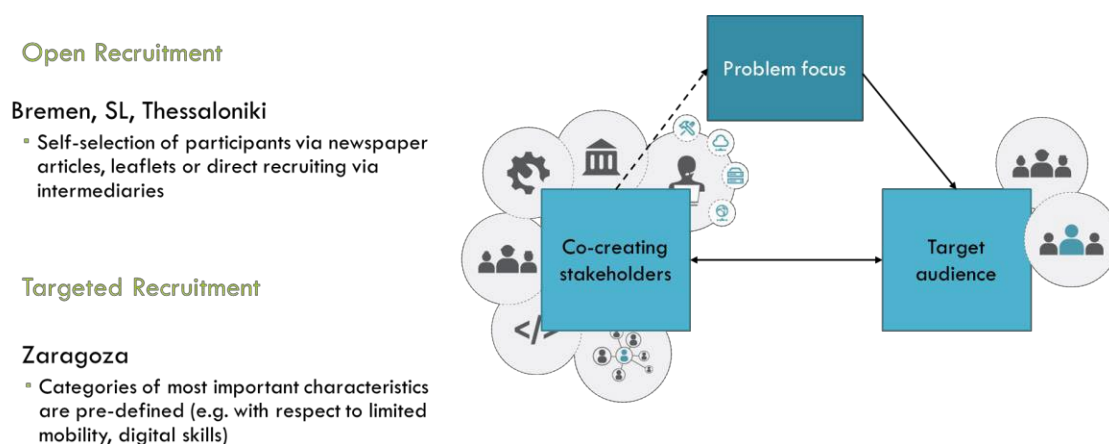


Figure 79: Openness and recruitment of co-creation processes

5.2 Project organisation/governance

A co-creation project has to be considered with respect to its governance and organisation as well. A project group has to be established which integrates the different roles. For the Mobile Age project we identified the following key roles:

- User of the service (target audience)

- Facilitator of the co-creation process
- Data provider/curator/creator
- Software developers
- Service Provider (e.g. sustainability, finance)
- Evaluator of product and process.

These roles may be assumed by any of the stakeholder groups:

- Older adult
- Social care service provider/ intermediary
- Government
- Other organisation (e.g private sector, university, NGO, senior citizen association)

While in Zaragoza and RCM government units initiated and coordinated the co-creation process, in Bremen and South Lakeland this task was fulfilled by research institutes/universities. The following table 12 provides an overview on the stakeholders involved in each of our co-creation activities as well as the stakeholder groups involved in the core project group. For example, in Bremen Osterholz we decided to establish a permanent group of eight to twelve Third Agers that would contribute to the whole process according to the Mobile Age co-creation model, i.e. from idea generation and developing the service concept over software and data design up to the implementation and maintenance of the service. In contrast, in Bremen Hemelingen, the core group consisted of a research institutes, software developers and a network of social care service providers. In Zaragoza and Thessaloniki the core project group consisted of local public administrations. Hence, the scoping of the projects and co-creation processes differed with respect to these governance structures.

Table 12: Involved stakeholders – project governance

Field Site	Bremen Osterholz	Bremen Hemelingen	South Lakeland	Zaragoza	Thessaloniki
Involved stakeholders	<p>Local/regional government (district council)</p> <p>Service providers (senior citizen meeting places, social care service providers)</p> <p>Other organisations and individuals</p> <p>Older adults</p> <p>Intermediaries</p>	<p>Local/regional government (district council, district marketing)</p> <p>Service providers (senior citizen meeting places, social care service providers)</p> <p>Other organisations and individuals</p> <p>Older adults</p> <p>Intermediaries</p>	<p>Local government (district council)</p> <p>Service providers (older adults services, housing and carers)</p> <p>Other organisations and individuals</p> <p>Older adults</p> <p>Intermediaries</p>	<p>Local government (open government unit, elderly care unit)</p> <p>Service providers (senior citizen centres)</p> <p>Other organisations and individuals</p> <p>Older adults</p>	<p>Local/regional government (IT unit, health department, EU project unit)</p> <p>Service providers (senior citizen centres)</p> <p>Other organisations and individuals</p> <p>Older adults</p>
Co-creation core project group (coordinating activities)	<p>Research institute (ifib)</p> <p>Software developer (FTB)</p> <p>Core group of older adults</p>	<p>Research institute (ifib)</p> <p>Software developer (FTB)</p> <p>Network of local service provider</p>	<p>Lancaster University (CSTO and SCC)</p>	<p>Local government</p> <ul style="list-style-type: none"> - Open government unit - Elderly care unit 	<p>Local/regional government</p> <ul style="list-style-type: none"> - IT unit - Health department - EU project unit <p>Aristotle University of Thessaloniki</p>

The governance structures of our co-creation projects has a number of implications for the co-creation projects.

5.3 Scoping of projects and embedding in existing resources/infrastructures

Perhaps one of the most apparent differences in the governance structures of our field sites is the embeddedness in existing infrastructures, collaborations, policy frameworks, initiatives (figure 80 on co-creation preconditions).

For example, in **Zaragoza** the scoping of the co-creation process was very much driven through its alignment with the city's engagement in the Global Network of Age-Friendly Cities and Communities (GNAFCC) and was expected to contribute to the city's overall strategy and objective. The main drivers of the process were two departments: the open government unit and the elderly care unit who have a continuous working relationship. For the co-creation activities and recruitment of older adults, the project team used its existing collaborations with senior citizen centres. The open data infrastructure and relating IT infrastructure played an important role in the planning of the project. For example, part of the co-creation process aimed at improving an existing Website for older adults, another part made use of an already existing collaborative map service.

Similarly, in **Thessaloniki**, two thematic government units collaborated: the IT department and the health department. Their existing service portfolio and objectives scoped their co-creation project in the direction of health and community services. This was further supported by the kinds of data available and produced by the health department. Similar to Thessaloniki, the project group used existing collaborations with senior citizen centres for recruitment.

In contrast, the research institutes in **Bremen** and **South Lakeland** were more open with the scoping of their projects. For example, in Bremen the role of certain local stakeholders shifted as the scoping of the project and service idea continued. On the other hand, the team in South Lakeland experienced how the existing ICT infrastructure (or better weak Internet coverage in rural South Lakeland) framed particular technological solutions as well as existing service infrastructure enabled particular service ideas (events app).



Figure 80: Dimensions of existing resources for co-creation projects

5.4 The role of intermediaries and service providers in co-creation processes

The close collaboration with intermediaries was beneficial to the co-creation process in several ways:

- They acted as **gate-keeper** to local government and supported the recruitment of older adults
- They acted as **champions** of our project and endorsed the process during council meetings.

- They acted as **communicators** by promoting the project in the local newspapers, their own publications and the district fair.
- They served as **data providers** with data about their own services and resources.
- They may ensure the sustainability of the service.

Intermediaries can take different supporting roles in co-creation processes. However, the prerequisite for their commitment is that the outcome will benefit their work.

In Bremen Hemelingen, we aligned our co-creation process closer to the services and resources of local social care service providers and intermediaries. Older adults were invited to participate as part of the service offerings of these service providers. We hence, circumvented “cold recruiting” as in Osterholz but embedded our project as part of existing services. For example, the meeting places offer a variety of courses and meetings. They were ideally positioned to adopt our tablet courses as part of their offers. Likewise did the neighbourhood walks fit well to the services provided by some of our collaborating service providers. Recruitment is hence more effective, as these service providers are already actively involving a broad range of older adults from the district. The drawback might be that some people might not feel addressed by certain places/organizers (e.g. the church, a certain neighbourhood).

When embedding the process in existing services and activities be aware that only a certain part of the target group might be addressed (e.g. through the church or in particular neighbourhoods). Consider to organise activities at different hosts and places.






Intermediaries facilitate the recruitment of older adults mainly in two ways:




- Explorative focus groups with groups of older adults with very different skills and needs. These included:
 - A group of older adults with mental health issues.
 - A group of older adults who regularly participate in activities from the protestant church congregation in the neighbourhood of Hemelingen.
 - A group of older adults from a seniors residence home.
- Recruitment of older adults for walks and walking workshops through the intermediaries’ communication channels.

As we were aiming to collaborate with service providers whose service portfolio could potentially be complemented with the digital district guide, we expected that they would also provide the most effective access to older adults interested in and in need of such a service. This was only partially true. In particular, the group of older adults with mental health issues and the group of older adults from the senior residence home did not participate in the co-creation activities beyond the two scheduled focus groups. This way of recruitment however, allows validating the service idea with groups of older adults that cannot participate throughout the whole life cycle of such a project.

Engaging intermediaries for the recruitment requires a deep understanding and commitment of these intermediaries to the co-creation process.






Table 13: Level of Co-Creation: Roles and tasks of intermediaries and service providers

Field Site		Bremen Osterholz	Bremen Hemelingen	South Lakeland	Zaragoza	Thessaloniki
Plan	 Facilitator	Engaging stakeholders (support recruitment)	Engaging stakeholders (identify and contact senior citizens groups, organise walks to attract older adults) Planning (organise focus groups)	Engaging stakeholders (support recruitment) Planning (providing facilities for workshops)	Engaging stakeholders (support recruitment)	Engaging stakeholders (support recruitment) Planning (organisation of co-creation activities)
	 Explorer	Co-creating a service concept (explore information needs in interviews)	Co-creating a service concept (explore information needs in meetings)	Co-creating a service concept (exploring available services and information needs in interviews, meetings and workshops)	No	No
Build	 Idea former	No	Co-creating a service concept (constant feedback on refined service concept)	Co-creating a service concept (constant feedback on refined service concept through participation in workshops and meetings)	No	No
	 Designer	No	No	No	No	No
	 Data provider/curator/creator	Collect data (focus groups with older adults)	Review, validate and complete collected/co-created data	Discussions on meetings about what data should be included or excluded from the app/service Collating and providing open data on services, events and volunteering opportunities	No	No




Run	 User of service/app	Evaluating the service (interviews)	Evaluating the service (interviews)	Evaluating the service (user testing)	No	No
	 Provider of service/app	No	Maintaining data on walks	There are currently plans to curate the user generated data (photos of event posters)	No	No
	 Diffuser	No	Promoting the app and the service on kick-off event	Plan to install apps on tablets provided to older adults Plans for promoting the use of the app (if implemented)	No	No

5.5 The role of local government in co-creation process

Table 14: Level of Co-Creation: Roles and tasks of local government

Field Site		Bremen Osterholz	Bremen Hemelingen	South Lakeland	Zaragoza	Thessaloniki
Plan	 Facilitator	Engaging stakeholders (identify local stakeholders and support recruitment by promoting the project) Provide facilities	No	Engaging stakeholders (facilitating the contact with some intermediary groups) Providing facilities for meetings Working with data	Selection of pilot districts Engaging stakeholders (identify and engage local stakeholders, ensure access to older adults) Managing and organizing co-creation activities	Selection of the health sectors Engaging stakeholders Managing and organizing and documenting co-creation activities
	 Explorer	Co-creating a service concept (explore information needs via interviews)	No	Co-creating a service concept (exploring available services and needs through interviews, meetings and workshops)	Co-creating a service concept (explore information needs as part of Zaragoza's age-friendly city initiative)	Co-creating a service concept (Explore data providers and existing data sets)
	 Idea former	No	No	Co-creating a service concept (participation in workshops and on meetings)	Developing questionnaire for exploring ideas to use collaborative maps	Co-creating a service concept (surveying existing Services, define the topic of health sector and the service, define possible services based on available datasets and older adults needs, defining data)
	 Designer	No	No	No	Designing and implementing digital service	No
Build	 Data provider/cu	Provision of data on institutions and public services in the district Review, validate and complete collected/co-created data	Support of the content provision by providing video material on walks	discussions on meetings about what data should be included or excluded from the app/service providing open data on services, events and volunteering opportunities	Publish and provide data on facilities and co-created data	Provide and curate data

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	rator/creat or					
Run	 User of service/app	Evaluating the service (interviews)	No	No	No	No
	 Provider of service/app	Integration of app in the official city portal Completion and maintenance of integrated data on institutions	Integration of app in the official city portal Completion and maintenance of integrated data on institutions	Working on plans to incorporate service/app to local digital services	Integration of service in the City Council's website	n/a
	 Diffuser	Promoting the app and the service on several events, supporting the dissemination of the service concept for other districts	Promoting the app and the service on kick-off event	Plans to promote the app through their digital services if implemented	Transfer of the service (applying the methodology and offering the generic tools to other cities and districts, worldwide or at least in Spain)	n/a

6 Outputs and outcomes of the co-creation processes

For most co-creation processes, we had three kinds of outputs

- **Data** collected, validated and co-created during the co-creation process.
- An **app** providing access to these data.
- An **digital public service** in which data and app are embedded and that is offered by a service provider that takes care of the maintenance according to a business model.

6.1 Data

Data are the central ingredient for any kind of information service. They are an input that is processed in the co-creation process to provide a final set of data framed in a digital online service which is accessible by an application via different channels and devices.

6.1.1 Availability and quality of data input

The availability and quality of data that was used as input differed across the field sites. This was partly due to the differences in open data infrastructures with Zaragoza having the most advanced infrastructure and partly because of the different use case scenarios of which digital services were developed.

For example, in **Bremen Osterholz** we developed a district guide which had to include data on several different kinds of objects, each with different attributes. Therefore, data input came from different sources. The original assumption was that most data sets would be available via the city's open data portal. This proved to be not the case. Only few data sets, relevant to the district guide, had been published on the city's open data portal, e.g. data on benches and toilettes. However, those data sets were not complete and not up to date. Data on relevant organisations and service providers in the district had to be collected and adapted from different sources in different ways. Data that were already provided by the official city portal *bremen.online* had to be imported into the demonstrator. Data from the printed neighbourhood reader had to be copied from the digital text file (publisher editing software) and data collected in the focus groups have been transcribed from handwritten sheets into digital documents. Not only different technical formats but also different semantic and syntactic formats caused a lot of work to translate the data to the profiles our co-creators had chosen. With regard to relevance, the transcripts of the focus groups identifying nice places were most important and at the same time of the lowest quality as in these groups members just provided keywords, used different names for the same places, mentioned things that they remembered but which no longer existed (see the iterations in the development of the data tables, described in section 4.9).

In **Zaragoza**, only data concerning certain aspects of the state of the streets concerning people with physical disabilities were available, although not on the collaborative maps. No data concerning age friendly routes was available before this project.

In **South Lakeland**, open data for the events app was available but not as complete or at the appropriate level of detail needed for the apps. The open data being currently used in the apps come from listings in local government and local organisations sites. They are capturing the information that comes from other organisations and venues that are producing or

hosting the events. The general information about times, place and description are usually included, but what the project did is to uncover that there are a plethora of information that would make attending the events accessible to older adults that are missing or presented inconsistently. The completeness of event information in our abstract concepts of the apps doesn't match the reality of the open data available. This was identified once those demonstrators started to be tested in our workshops.

The table below summarises the information that is necessary to provide the accurate information so much needed by the older adults and how it needs to be presented in order for apps like ours to use it consistently:

<i>CATEGORY</i>	<i>DESCRIPTION</i>
Name of event:	Short but meaningful.
Category:	Meaningful to older adults and not organisers that clearly indicate the content of the event.
Venue	Include post code and GPS location.
Date	Individual occurrences of an event. Not a date range.
Time	Standardised time entry (for example 22:00 or 10pm?) and separate occurrences for events at multiple times.
Description	Should be short and clear and explain the content of the event.
Cost	Identify costs and when discounts for older adults apply (explaining the rules).
Accessibility of the event and venue	Information about accessibility of the events and venues for people disability as well as older adults with reduced mobility stipulating if they might need support to attend.
Is booking or tickets required?	State if there is a requirement to book or buy tickets. Information how bookings can be made and tickets bought.
Contact name	If possible a person the older adults can contact about the event.
Contact number	Phone numbers users can phone for information.
Website	A link to the event listing on a website and not just to the venue website.

6.1.2 Quality of final data sets

In those cases where senior citizens co-created data and validated existing data, the data sets can be enhanced.

However, as we noted in **Bremen Osterholz**, because collecting and editing relevant data was very time consuming during the process we had to reduce the range of categories and attributes. For example, originally and in addition to the service categories, advice, sport and cultural services, information on educational services had been proposed by our participants. As a result of a prioritisation exercise this category had to be dropped. With regard to the nice places, attributes such as physical accessibility or safety relevant information, e.g. data on lightning, were not available and could not be generated in the required quality and therefore had to be disregarded as well.

For the categories and attributes included in the final service the data generated in the process have been checked several times with respect to their completeness, consistency, accuracy and up-to-datedness. In the course of the migration to the final service provided by the official city portal a broader consistency check has been made and all the intellectual property rights for texts and logos and photos have been obtained from the data owners.

6.2 Apps

The five different apps developed in the four field sites are the main technical output of the co-creation processes.

- In **Bremen** two map-based social networking and mobile open information services, connecting people, open data & place through social networking for older adults were developed.
- The **South Lakeland** demonstrator, Mobile Age: Social Connectedness (working title), is designed to encourage independent living by tackling the problem of social isolation and loneliness. In particular, it allows older adults to benefit from on-line information regarding social events, services, and volunteering opportunities in their area.
- In **Zaragoza**, a map-based data curation and collaborative map creation tool was developed empowering older adults to create collaboratively maps with accessible routes and alert city.
- In **Thessaloniki** a health-related open data information services for older adults was developed, consuming open data feeds for older adults and thereby help them finding, contacting and navigating to health services such as nearby open hospital and pharmacies.

The functionality, accessibility and usability of the apps are important indicators of the quality of the output. In particular, their accessibility and usability is assumed to be high through the co-creation activities (in contrast to applications developed without the involvement of the end users). As reported in Deliverable 3.6 (Evaluation Report) the apps were evaluated via tests of the functionality based on navigation diagrams of the applications performed by developers, accessibility tests based on the web content accessibility guidelines performed under laboratory conditions and finally usability tests based on the guidelines on usability testing from the European Commission Information Providers Guide and the usability standard ISO 9241-110, which were performed with end-users of the applications.

The **evaluation results show that all demonstrators achieved very good results on all tests performed**. The **functionality** tests were all passed successfully as expected, because the functionality was regularly tested during development on all field-sites.

Also the tests for **accessibility** were finished successfully, even if some issues were found during the tests and had to be fixed.

The **usability**-test items of the ISO 9421-110 questionnaire were considered to be too complicated during a pre-test performed in Bremen and therefore simplified.

Generally, the users assessed all apps very positive, but there are indications of differences in the results between co-creators and others, which may be caused by the circumstance that co-creators observed the applications' evolution and simply got to know the functionalities during the co-creation process. Some issues rose from a lack of knowledge regarding the general use of mobile devices and the operating system. As a lesson learned it has to be stated that an introduction to the basic device-handling is strongly recommended to avoid such.

Furthermore, the usability test pointed out, that some of the topics were hard to evaluate for the users. To assess the error tolerance of an application, for example, cannot be assessed, if the application does not provide an opportunity to raise errors. Another finding at some field-sites was that following the paradigm of universal design within the apps can raise problems in the perceived suitability for individualisation. The apps respect the devices settings regarding high contrast mode or font-size, but do not provide a control for setting it in the app itself. To avoid that fact, allowing for customisation is recommended. As a direct action following the usability tests, the search page of the South Lakeland-Demonstrator was re-designed. The key performance indicators of the Mobile Age project that were applicable to the evaluations reported in D3.6 have been identified and their outcome has been calculated as passed for each app.

6.3 Service

Service in this context refers to the social innovation in form of software and data that is embedded into a larger online portal and provided to the general public by an organisation according to a business model. According to this definition, the Mobile Age demonstrators were not services but input for services. In the case of Bremen, both demonstrators have been migrated to the city information portal (www.bremen.de). In Zaragoza, the city administration will continue to provide the collaborative map service to its citizens. In South Lakeland, the team is still negotiating with local stakeholders.

Based on these initial steps, we can make some arguments about the value of the services developed for older adults and for government, in particular for Zaragoza and Bremen.

6.3.1 Zaragoza

6.3.1.1 Value for older adults

The participative processes represent a useful instrument for the development of democratic societies. The involvement of the citizen, in the processes of decision making, as well as the ability to be actively involved through methodologies based on co-creation and participation, reinforce the value that citizens give to the actions that are developed in terms of strengthening and sense of belonging decision capacity.

Thus, the validation of methodologies such as those of the project in question, generating co-creation processes, generate positive effects both for the participants of the process and for a broader audience of older citizens, since it generates replicable performance dynamics in other areas of the city. Regarding the final product of the project, age-friendly routes and improvement of the major's website, it is obvious that the improvement of the urban environment affects all citizens, both the elderly and the rest. In the same way, the improvement of the usability and content of the portal of the greater one repercussions without a doubt for the benefit of all the users of the same one.

6.3.1.2 Value for government

The city council as public administration has a privileged position to promote the democratic process aimed at improving the involvement of the citizen in their environment and if linked to the operation and development of participation processes.

In this sense, the validation of appropriate methodologies for the co-creation process represents a technical instrument applicable to other municipal actions. The realization of improvements and repairs that increase the friendliness of the urban environment facilitates the city council's improvement and maintenance, but also gives specific answers to demands made directly by the citizen.

6.3.2 Bremen Osterholz

The assessment to which extent the service provides relevant information to older adults and the different groups of other stakeholders, is not completed yet. However, we have received some feedback in interviews with participants, service providers, intermediaries and government.

6.3.2.1 Value for older adults

As it has been reported in the formative evaluation participants of the co-creation process were satisfied with the content of the service. They considered the 17 nice places and 75 service providing organisations as complete and the information as correct, comprehensive and appealing. However, the target group of older adults is larger than our group of co-creators. The assessment of relevance and quality by external older adults will be done later in connection with an impact assessment. So far, positive feedback on the content of the app was received during the official launch of the service in February 2018.

In a focus group with three neighbourhood managers, working in less privileged neighbourhoods in the district, they confirmed that **information provision** in general is a relevant factor for social inclusion. However, they saw limitations with regard to the general issue of accessibility of digital technologies (technical equipment, skills, interests, fear). That is why they produced the printed neighbourhood reader.

They recommended public access terminals and a **printed short version** of the most important content. As their printed district reader included the service providers but not nice places and walks, we decided to print a booklet with the 17 nice places. This has been published on the day of the launch of the online service on www.bremen.de and will be distributed via their offices as well as via the district office.

In addition, the intermediaries are critical about the accessibility of the service in terms of its sustainability and up-to-dateness. As one of the neighbourhood managers puts it:

Well, I'm not so sure if it's really going to reach the seniors. ...If you are looking for something, when you search purposefully, for example, I want to go to the swimming pool in the OTE hall in Osterholz for example and when are the opening hours, then I would google it. Then I wouldn't find it. And then whether I bump into this side, I don't know. [...] Well, I think that as supplementary information such a thing is good, but as I said before, it has to be kept up to date and if I am looking for it, I have to find it.

With the migration of the content to the city portal and its feature of self-administered updating by data owners on one side and the commitment of the providers of the city portal to maintain the data of the 17 nice places for a duration of 2 years, sustainability is ensured.

An open question is the relevance of the information provided for different groups of older adults, in particular with regard to central issue of social inclusion, connectivity and participation. The relevance of the objects and attributes selected reflects the needs of a particular subgroup, mobile, comparatively well-educated, and engaged. One of the neighbourhood managers suggested that for older people with health issues or financial constraints this kind of information provision might not be as relevant: "Well, I think that's going to do well for those who are better off." The other neighbourhood manager explains:

And the fewest have a large iPad or a PC with a large screen. I saw that also in this PC course for older people. Some people said: "Oh, that's interesting, now I dare to buy one of those things, now I know how to do it. That's what the residents are like, but I'll tell you those from the blocks that don't live in condominiums or in single-family houses, they're really into it, they like it. However, most of these residents are poorer people who don't have these technical possibilities, they miss it.

6.3.2.2 Value for intermediaries and service providers

In addition, the interview with the neighbourhood managers demonstrated, that the service is not only relevant to older adults but also to intermediaries and local service providers as it may support them in fulfilling their tasks:

It would be more important to have all these multipliers. And I think that's good for them, because for many of those who work in Blockdiek [area with low socio-economic status], they don't know what the neighbouring facility does and can do. It is so..... The managers might know about it, but the normal employees, if they work part-time even, they don't know what the institution around the corner is doing, what they have to offer, or that there is one at all. In this regard THE SERVICE is totally valuable, because they could say I have a web page here, take a look at it. That would be important.

In this regard, the digital district guide can support the **networking of local service providers** and consequently facilitate better service provision.

The intermediaries also assess the content as being oriented towards older adults as target audience (addressing their needs and interests). Categories that were defined in the process are being confirmed by the neighbourhood managers as being relevant to older adults when moving outside:

For example, that you have toilets, which is always such an important point especially for elderly people, but also the café where you sit together and enjoy something, but also stairs, accessibility plays a role.

The service providers that were listed in the demonstrator with data from different sources have been asked to give consent to publishing these data in the final service provided and

maintained by bremen.online. So far, almost 90% have agreed. A few answered that their service did not address older people. The high agreement shows that service providers actively took this opportunity.

6.3.2.3 Value for government

At the launch event of the service in February 2018, a director of the State Ministry of Social Affairs, Women and Seniors confirmed that the content of the services is highly relevant and compliant with the objectives of the recent political priorities and four central issues with regard to seniors:

<i>Political objectives</i>	<i>Corresponding part of the guide</i>
The district as home Districts are central for integration and social participation and politics should support people to stay in the district as long as possible (ageing in place)	The guide provides information, where people can get advice
“Stadt in Bewegung” [City/Citizens in motion] Physical exercises (indoor and outdoor, e.g. in sporting clubs) shall be supported	The guide lists all sporting clubs in the district and information on nice places to walk to
Living together in a growing city Opportunities for social participation will be improved in order to develop the city and improve tolerance for differences	The guide includes all the indoor meeting places of the district, inviting people to get together there
Good services for the city and its people	The guide itself is a good service for the district

Table 15: Value for government

The service supports all four policy objectives and thereby the ministry can support similar processes in other districts of Bremen. The director outlined some of these correspondences and explained why such a service could be a “good practice case” for other districts. He welcomed the offer by bremen.online to provide the templates of the Osterholz-Guide for initiatives from other districts. The good practice guidebook (D1.8), to be developed towards the end of Mobile Age, may further support the development of such services in a co-creation process. It will hence be important to translate (parts of) the guidebook into German.

6.3.3 Bremen Hemelingen

In how far the information actually activates and motivates older adults will be subject of the impact assessment. Here we focus on the question if and for whom the service is relevant and appealing as well as the estimation of service providers and older adults in how far the service has the potential to activate older people and to support their work.

The social activities manager emphasizes the special appeal of the multimedia information:

I also find it simply well turned out well, optically, with these word contributions or with the small videos, which are inserted and where then you can see the walks and the people, who were there, that I find already beautiful.

6.3.3.1 Value for older adults

All stakeholders assess the service as being relevant to older users. The overall relevance for this particular target group is seen in the relevance of walking for older adults. As the social activities manager says, that “going for a walk is much more part of the reality of older adults than of younger generations”. And the director of the association for social work (MoBiLe) adds the dimension of retirement:

I believe that [...] for other people who already live here, but maybe have always worked, always had a family around them and maybe are now in a situation that they now also have time to do a bike tour or something.

Besides the overall relevance of walks for older adults the service providers, intermediaries and participants define the value of the service for particular groups of older adults. Most of the stakeholder emphasize the value of the walking guide for **older people who are not well oriented in the district**. The director of association for social work (MoBiLe) says:

With such a portal you reach the people who are still fit, who can still walk, but they are also important to reach, right? Because these are often those who can still walk, but have no more ideas

Also the social activities manager confirms the idea-giving effect of the app and adds that the service can help older people to find their way when walking:

Well I think that the people who want to know, they will certainly orient themselves to it. [...] And I think in this regard it is an excellent thing to get people moving again, because then maybe they know again, where can I go? Something they may not have known before or haven't had any idea at all [...]. Or if my neighbour tells me, you know, if you want to go out, then just walk into the Schleng-Park then the person also thinks, yes nice, but if I don't know where the Schleng-Park is and I'm new here then it can be very very helpful, if the route is drawn in correctly and the you have about an idea where to go.

The value of orienting is according to one of the participants not only relevant when navigating to nice routes, but also for older adults who might get lost because of mental decline. In this case the service might have a value for relatives as well:

If a 75-year-old says that I want to wander around the district, I might get lost, I forget everything, then the daughter says, the son says "Take one of these things with me". 'Oh yes, it works' - yes and then there is a need

The director of community centre also sees a value for **(older) people with mobility issues**. On the one hand because the service provides routes with “various difficulty levels”:

and they [the walks] are all regarding the length I find them wonderful to walk, that's also my opinion, even with people with walkers you can run 2.4 kilometers or 1.8 or what ever [...] and I find that quite good that you simply have different possibilities.

On the other hand she also estimates the service relevant for people who cannot move outside and with the help of the service can “follow the route virtually”:

So, if I would be bonkers, I would say this is perfectly suitable, if you put someone on such a bike ergometer and then run this film about the walk Schleng-Park or Weserwehr or whatever and then, if you do it very slowly, you can also follow the route virtually

Furthermore she sees a value for **older people with dementia**:

our dementia patients, for whom this is also a great event, even if they may not be able to cope with it in the same way, but perhaps to evoke memories, right, of the past. I don't find it so uninteresting

The director of community centre further estimates the service particularly relevant for **older people with little money**, who cannot afford to spend a lot of money for travelling:

And especially in Hemelingen and especially with not only the age structure, but also with the financial structure in this neighbourhood and in this district [...] Mahndorf is bourgeois, but in particular here in Hemelingen or also in Sebaldsbrück we have of course also many fellow citizens who simply have no money at all or little and certainly not at all to arrange leisure time.

Besides not having the opportunity to travel abroad, she sees a general value in „creating experiences that lay right on the door step“ also in order to create a better image of the district. This is supported by the statement of a participant that also affirms the increasing relevance of the local environment in older age:

'Why wander far away, good things are so close'

The social activities manager mentions the issue of **loneliness and fear** that in her opinion is addressed by the service. Because as she says for older people “walking alone is associated with fears”. And one of the participants adds the social dimension and says that amongst older adults there is:

The tendency is always 'I don't have anyone to go with me' or so, [...] then you can make an appointment if you want to do this or if you want to do that. And then it always goes 'If the others would, then I could' or so. This inertia [...] it's basically like this that many people say 'I shall go to the park alone?!' or something. I mean, the best example is Mr G, an Arbergen resident who says 'I've never been to this park', that fascinates me.

6.3.3.2 Value for intermediaries and service providers

While all stakeholders see a substantial value in the service for older adults, the service providers are not all convinced of the relevance it will have for their work. When asked if they could imagine if and how the walking guide could support them in their work, most of them avoid the issue. However, two service providers have announced to conduct further walks in the next year, using our digital district guide. The neighbourhood manager sees a supporting function in the service for her work, since she often acts as a contact person for all kinds of questions of especially older adults:

So perhaps it is another support, if you have eight walks or ten walks on such a page or in such a brochure and if somehow one is attacked with such questions like 'where can I go for a walk here at all? There is nothing here' [...] and then one can say, 'yes you can go to the Schlengpark or where else can you go' and then you are considering and then you would have the guide and can open it and say, 'look, there you can, there you can, there'. So you would have something compiled on which you can fall back, which did not yet exist. [...] or 'just have a look at the website, there are ten, twelve suggestions, where you can walk nice routes and, uh, get to know other things without using the car or just by train and bus or maybe actually by bike'.

This relative lack of seeing an immediate benefit for the own work may be due to the fact that the intermediaries have been involved—foremostly—as supporters of the process and not as future users. If we had considered this role more strongly, we would have set-up a second

small co-creation group that looks at the ways they organise and announce walks, the problems they encounter and how a digital service might be helpful. In a final discussion, there was the idea that a separate editing function might support designing and printing the announcement of walks which are pinned on news boards. Another option might be a calendar function with the walks that are offered by different service providers with an online registration, so everybody can see how many people are expected to participate. In a kind of community building even volunteers might suggest or announce walks by themselves on such a platform.

A separate subject is the value with regard to e-inclusion. The director of the association for social work, who is just planning to organise ICT courses for older adults, wants to use the walking guide:

'Then we will also open a group here for people who have never been engaged with these media before. [...] and then we want to show them that it's not that bad, that you can really do something [...] And then I wanted to take your page just as an example, right? So one shows them 'look' so they can see, that the Internet can also be used very quickly for one's own gain, right?

Further ICT courses are planned by two service providers.

6.3.3.3 Value for government

The following table shows how the service relates to the objectives of the recent political priorities and central issues with regard to seniors defined by the State Ministry of Social Affairs, Women and Seniors.

<i>Political objectives</i>	<i>Corresponding part of the guide</i>
The district as home Districts are central for integration and social participation and politics should support people to stay in the district as long as possible (ageing in place)	The guide informs older adults of nice places and walks and thereby helps creating an image of the district as worth living.
“Stadt in Bewegung” [City/Citizens in motion] Physical exercises (indoor and outdoor, e.g. in sporting clubs) shall be supported	The guide informs about walking routes and shall motivate older people to exercise outside.
Living together in a growing city Opportunities for social participation will be improved in order to develop the city and improve tolerance for differences	The guide offers the possibility to organize joint walks and thereby supports the social participation of older adults.
Good services for the city and its people	The guide itself is a good service for the district and its image as well as for the people

Table 16: Evaluating the value for government

The service supports all four policy objectives and thereby the ministry can support similar processes in other districts of Bremen.

6.3.4 South Lakeland

As stated above, the Mobile Age Social Connectedness apps have not yet been implemented in South Lakeland, however both South Lakeland District council and Age UK showed interest in seeing the apps implemented in the area and indicate that they believe the app could be beneficial for the older adults in the region.

We have also conducted evaluation of the demonstrator with older adults, carried out interviews with intermediaries where they commented on the apps showed to them and in the last workshop we conducted, we brought together co-creators, a service provider and an intermediary to work through scenarios of how the social connectedness apps could be used in the future.

In addition, we are in the process of conducting a pilot study together with Age UK South Lakeland where Amazon Fire Tablets loaded up with the app are being tested for 4 weeks with 9 volunteers (7 of them older adults over 55 years old). They will be using the apps and reporting back on their experience. While we have not yet concluded the evaluation of the service for the field site, we have some preliminary results that indicate the potential for value creation for the stakeholders involved if the digital service provided by the apps were to be implemented.

6.3.4.1 Value for older adults

During the co-creation process, activities such as probes, user testing and evaluation activities provided some insight into how older adults might use the Mobile Age Social Connectedness apps and how they might benefit them.

Participants told us that they **found out about events** using the app that they were not aware of. For example, Julie found a concert using the app. When asked if she would have known about it she affirmed:

”I wouldn’t know about it (...) without the app. No.”

Mary added to this comment :

“I saw several things that I didn’t know. I’ve made a note of them. Put it on the calendar...”

In analyzing Julie’s digital cultural probe we found that she did attend the concert she identified using the app and there were photos of that event in the picture she took with the tablet provided in this experiment.

They also reported about **finding out about new routes using public transport** that they didn’t realise were possible. Steve commented:

“You can get to places I never thought was possible because buses from Kendal don’t go directly, but by getting a bus from Kendal to point A, then you can get a bus from point A to point B.”.

The transport options on the apps show the buses numbers, for example and specifies where and when the connection to other public transport can be made.

When asked about how useful they thought the apps and the service they provide were. One of the participants gave this answer:

“I think that other people will find it useful as well. It will enable them to get out and about more.” (Steve, co-creator)

Also there were comments on how the apps could **help people to learn how to use digital technology** and services

“if they are nervous about going on the app themselves, the families can help them find things to do and maybe they will learn in the end to look for themselves...” When asked if the app could help them to become less fearful of technology, she added “I think it could because all the information is in one place, they are not having to go into the big bad web and look for everything,”

These initial impressions show the potential for the service to be a source of information on local activities and transport options that are not easily found together elsewhere, and therefore enabling older adults to access those activities. The service could also provide a stepping stone for older adults to become more engaged with digital technology.

6.3.4.2 Value for intermediaries

For the intermediaries that we spoke to, the main value created by the service was in **identifying local services that could be accessed by the older adults they help support**.

During the launch of the pilot tablet loan scheme, one of the participants who is a volunteer and works with older adults suggested that she was going to use the **app to find information for her clients**.

Even those intermediaries that were connected to older adults that were quite independent could see the **benefit of the service if the condition of their relatives deteriorated**. One of them cited her mum being unwell for a short while and the difficulty in finding about service in a different part of the country. She believe that the Mobile Age Social connectedness app would have helped her identify relevant services if there was need again for further support to her mother.

6.3.4.3 Value for service providers

More and more often, organisations are having to provide services digitally (online) because of the need to reduce cost due to cuts to funding. This has been identified as a problem for the older adult population where the level of adoption of digital services is low. For service providers working in South Lakeland, the Mobile Age Social Connectedness apps represent a way to **engage older adults with digital technologies**. At present a pilot scheme is being trialled in South Lakeland where Age UK is lending tablets to older adults with the Mobile Age apps. The person organising the tablet loan scheme in Age UK had this comment about the apps:

“It’s an easy win for older people, because it is so easy to use. They can just tap around, see familiar things, things that you know, things that they heard about, engagement opportunities or whatever maps and localities they are familiar with, so it is an easy win. It will help them engage better.”

With the use of the apps, once it is adopted, we also expect to see an increase in awareness about events, services and volunteering opportunities. In addition to that the use of the apps

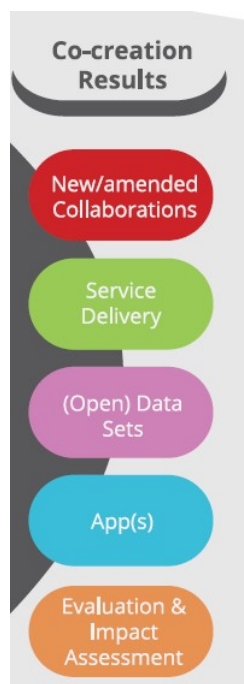
will also produce analytic data that can be accessed by the services implementing the app. There is the potential for this data to generate insight in how services can be better adjusted to meet the needs of the older adults using the apps.

6.3.4.4 Value for Government

The effects could be similar to the ones described above but in the case of the SLDC this could particularly help them in delivering their digital programme. It is call Customer Connect and aims to increase the use of council services digitally. One of the main barriers to adoption is the low number of older adults using digital services. They expect that adopting the Mobile Age Social Connectedness apps and incorporating it to their Customer Connect Programme, they will be able to reach the older adult population and the simple interface and portal structure of the apps could be the starting point for **enabling older adults in accessing their digital services**.

“We see this as a route in to access all of our services and scaling it up in such a way that the app could be used as a mechanism for people to access our own systems.”

6.4 Discussion: Contributing to age-friendly cities and communities



The output and outcome of a co-creation process (figure 81) can be distinguished between data, apps and the service to be run. In addition, there may be new or amended collaborations between different stakeholders. Ideally an evaluation of the co-creation process and output is carried out, so it results in an evaluation and impact assessment.

Figure 81: Dimensions of existing resources for co-creation projects

Table 17: Action areas of WHO age-friendly cities and communities guidelines and Mobile Age contributions

Action area	Objective	Mobile Age contribution
Places to be and stay outdoors	Benches and toilets	Mapping benches and toilets Installing new benches/repairing broken benches
	Safe and clean environments	Information about safe and clean environments (e.g. lightening)
	Places for recreation and leisure	Information on places for recreation and leisure
	Parks and green spaces	Information on parks and green spaces
Infrastructure for active mobility and walkability	Promoting walking among older people	Information on accessible and interesting routes
Range of opportunities for social participation that are accessible for older people	Empowering older people to participate in activities and increasing awareness of existing activities	Information about events and their accessibility
Supportive environments for social exchange and places and providing opportunities for social contact in the community, neighbourhood	Support neighbourhood centres	Information on neighbourhood meeting places
	Support day care and activity centres	Information on support and activity centres
Multilevel interventions	Combining the promotion of physical activity with social and cognitive activity	Involving people in disadvantaged districts in designing walking paths and tours in their own neighbourhoods Involving older adults in the creation on historical walking paths Providing historical information on walking routes Facilitating formation of local groups of older people to meet regularly to exercise training in computer, tablets and internet skills
Lifelong learning	Promoting lifelong learning	Providing tablet courses for older adults
Respect and non-discrimination	Combating ageism	Challenging existing representations of age through co-creation
	Promoting a positive image of ageing	Promoting positive role models (e.g. senior citizens “pioneers” in ICT)

Social capital	Strengthening community ties	Providing information on activities across neighbourhood borders encouraging interactions inside the whole district
Engagement in political life and decision-making	Forms of participatory mechanisms	Co-creation of a digital district guide
	Consultation of older people in the definition of problems and actions needed	Focus groups on problems and needs that can be targeted by online information provision
Engagement in public life: Co-creation and volunteering	Promoting co-creation: Involving older people in the design and delivery of services that affect their lives	Involving older people in the development of a digital public services

The sustainability of the services co-created in Mobile Age was a key concern for the whole team. As described above, Zaragoza and Thessaloniki included the services in their existing service portfolio. In Bremen and South Lakeland we have different scenarios.

Table 18: Sustainability of Mobile Age services

Field site	Bremen Osterholz	Bremen Hemelingen	South Lakeland	Zaragoza	Thessaloniki
Service provided by	Local government (operators of official city portal)	Local government (operators of official city portal)	SLDC and AGE UK South Lakeland are currently exploring the possibility of hosting. Both are positive but are reviewing their resourcing	Local government (city council)	Local government

Whereas in Bremen the official city portal had agreed to maintain the service, it turned out that this was not as easy as anticipated. Even though we were in close contact with the portal providers throughout the process to ensure compatibility, our co-creators made a number of design decisions that could not be implemented on the official portal due to its own corporate identity guidelines. Below we provide screenshots of our neighbour guide in Bremen Hemelingen (on the left hand side the version from the official city portal; on the right hand side our Mobile Age demonstrator). Differences cover for example the embedding of the services in the overall embedding of the district guide (at the city portal you can see several other headings on the top and different social media channels on the bottom). The map, that had been co-designed with older adults (see also our Senior Citizen Engagement Report) could not be used as a layer as the city portal uses Google Maps as default. There are several other differences here.

However, the point we want to make is clear. **The more open the process and the less restricted by existing infrastructures, the more difficult it is to make it sustainable.** In the end, we had to give up on certain design features in order to ensure the overall sustainability of the service.

There are now other districts in Bremen which have signalled their interest in co-creating a digital neighbourhood guide which would then be maintained by the city portal. Those

districts, would of course have to be more obedient to the constraints set by the current ICT and data infrastructures.

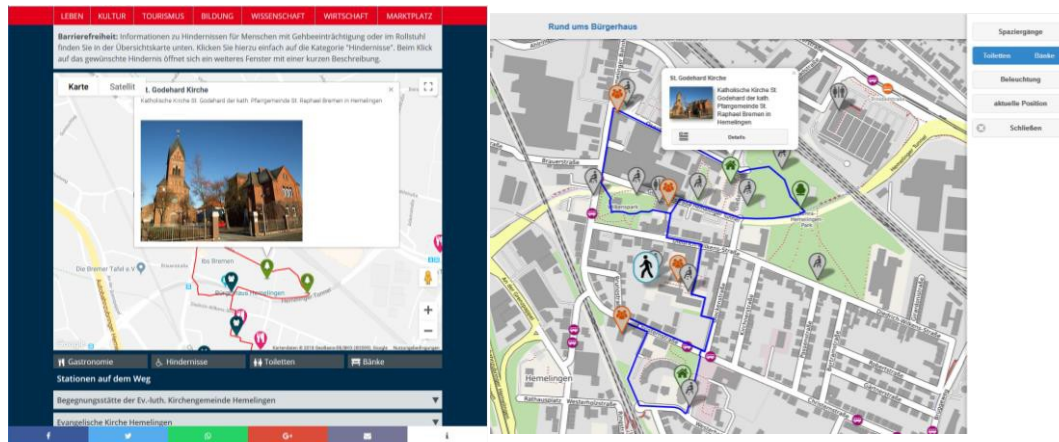


Figure 82: Comparison MobileAge demonstrator Bremen Hemelingen and service provided by city information portal

We cannot comment on the final outcome for South Lakeland as they are still exploring possibilities of hosting through either South Lakeland District Council or AGE UK South.

7 Conclusion: Civic co-creation for ageing societies

In our three analysis chapters, we have provided discussions on:

The role of older citizens in co-creation processes (chapter 4)

In this chapter, we reviewed methods from co-production, co-design and civic open data use and discussed how we adopted these methods for Mobile Age co-creation processes. We demonstrated that depending on the problem focus and scoping of the projects, **methods were adopted differently and enabled older adults to assume differing roles**. For example, the data workshops in Bremen Hemelingen and Zaragoza facilitated different role-shifts for participating older adults. Across all five co-creation processes, older adults assumed the different roles as defined in chapter 4.12.3 with an emphasis on idea former, data curator and user/tester. In addition, we argued that it is **important to consider to what extent methods enable older adults to share their tacit knowledge and expertise** (conceptualised in section 1.8.4), e.g. through the use of cultural probes (section 4.5.1).

The role of intermediaries and service providers as well as local government in co-creation processes (chapter 5)

In this chapter, we analysed the ways in which our co-creation processes were set-up and conducted differently (e.g. with respect to their governance structures, their openness and their scoping of the project foci). **Intermediaries can take different supporting roles in co-creation processes**. However, the prerequisite for their commitment is that the outcome will benefit their work. In our co-creation processes, intermediaries assumed all roles but the one of a designer. One of the main learning points was that in the context of age-friendly cities and communities, **intermediaries and social care service providers, should also be understood as future users** and hence be involved as such in co-creation processes.

Local governments assumed different roles in our co-creation processes: While they were organising and managing the co-creation processes in Zaragoza and Thessaloniki, they assumed a rather supportive or consulting role in South Lakeland and Bremen. **This resulted in differences concerning the openness of the processes, the scoping of the co-creation projects as well as their governance.**

The (potential) contribution of co-creation with older adults to age-friendly cities and communities (chapter 6)

In this chapter, we analysed the outputs and outcomes of our co-creation process: (1) the availability and quality of data, (2) the apps and (3) the resulting services. As a result, we provided an overview of activity areas for increasing the age-friendliness of cities and communities (as defined by the WHO) and how Mobile Age had contributed. We realised that **the main contribution lies in the co-creation of digital public information services**. Only in Zaragoza a communication service was implemented.

Initially we provided an overview about the objectives of some of the roots of co-creation. Based on the experiences from our own five co-creation projects and our survey of other EU-funded co-creation projects we can conclude that most of these aims and objective may be also found in co-creation projects. However, we also observe that they are partly contesting each other. In particular, we argue that there is a tension between the openness of a co-creation process (e.g. with respect to its scope, problem focus and recruitment) and the sustainability of its outcomes. **In the following, we would like to draw attention to three**

specific aspects: (1) the challenges of framing citizens as users in co-creation projects, (2) the tensions and possibilities arising from the co-creation of digital public services and (3) the challenges and opportunities of civic engagement with open data.

7.1 From citizens to users and co-creators

For long, it has been claimed that the success of participatory projects depends on the involvement of appropriate and representative users (see sections 1.4 and 1.7). What we realised in our own co-creation projects as well as our survey of others, is that it is actually tremendously difficult to involve citizens in a participatory process. This has to do with the ways in which many of the methods derived from co-design of technology are envisaged for smaller groups of people or more homogeneous groups of people (e.g. with similar levels of expertise, interest etc.), yet ideas for co-producing services and engaging citizens are based on ideas of representation.

The **question of representation and ultimately legitimacy** of the co-creation process poses a number of challenges. There is for example the question, whether co-creators represent the different subgroups of the target audience adequately and further what the most important attributes with regard to the problem focus are that need to be represented. These are decisions which are usually made before the start of a project, when it comes to defining the users and use case. However these prospective users are defined, we have witnessed (as have others) that those older adults with higher social capital and who are very active/included already are more likely to sign up to co-creation processes. They will be more likely to feel invited by newspaper articles or announcements in the communications of local service providers. Older adults, with higher degrees of dependencies or impairments may be reached through elderly care services. However, their contribution to the co-creation process may be more punctual.

It is important to recognise that any co-created service cannot fit older adults in general, but needs to consider their specificities with respect to the problem focus. Part of the representational dilemma may hence be better addressed by inviting experts (such as service providers or intermediaries) to become co-creators. Furthermore, our results show that a more specific definition of the target audience is required in order to meet its specific needs. The needs of third agers for example differ very much from those of citizens living in their fourth age.

Turning (older) citizens in prospective users seemed to solve a number challenges as outlined in section 1.3. One was the gap between the digital public services provided and their actual usage as well as perceived use benefit by citizens. So far, it is still too early for us to assess the impact of our own co-creation activities. We can however state, that the impact of a service is never a direct one. Media and communication research shows that the acceptance of a media technology depends to a large degree on its successful integration in the everyday life of people. This in turn is strongly connected to the question if and how a service is meaningful to someone and hence corresponds with the main finding of our work that the co-creation process needs to start with the existing support practices already in place (neighbourhood resources) and the everyday practices of future users.

7.2 Co-creating sustainable digital public services

Sharing control

The sharing of control in participatory design processes was established as a key aspect (1.4.2) in addition to the sharing of expertise and the enabling of technological change. In chapter 5, we have described a tension with respect to how the openness of the process translates partly into the sharing of control ranging from decisions over the problem focus, target audience to decisions concerning the service idea and design. Above we have argued that the openness of the process is partly framed by the initiators of such a process and their objectives. Co-creation projects taking place in research settings (or led by research institutes) are more open, e.g. with respect to the framing and the problem focus, because the researchers themselves are pursuing other objects. In our case, the primary interest in South Lakeland and Bremen was on the development and evaluation of effective co-creation methods and methodologies with older adults. In Zaragoza and Thessaloniki, the problem focus was embedded into the cities' overall strategies and objectives.

Hence the output and outcome of a co-creation process (grey box on the right in figure 83 below) are directly linked to existing resources (grey box on the left in figure 83 below). All our co-creation processes made use of existing co-operations between relevant stakeholders (e.g. local government, social care service providers, intermediaries, senior citizen associations). The sustainability of the results outputs, depends on how they are embedded in these co-operations or are able to ignite new co-operations.

Hence, co-creation facilitators/initiators need to consider a multitude of actors and constellations in which such projects take place and responds to the challenges that emerge in these complex socio-technical processes. As such co-creation is best understood, not as a purely social process, but rather that it is important to consider the materialities of data, ICT or transport infrastructures, mobile devices.

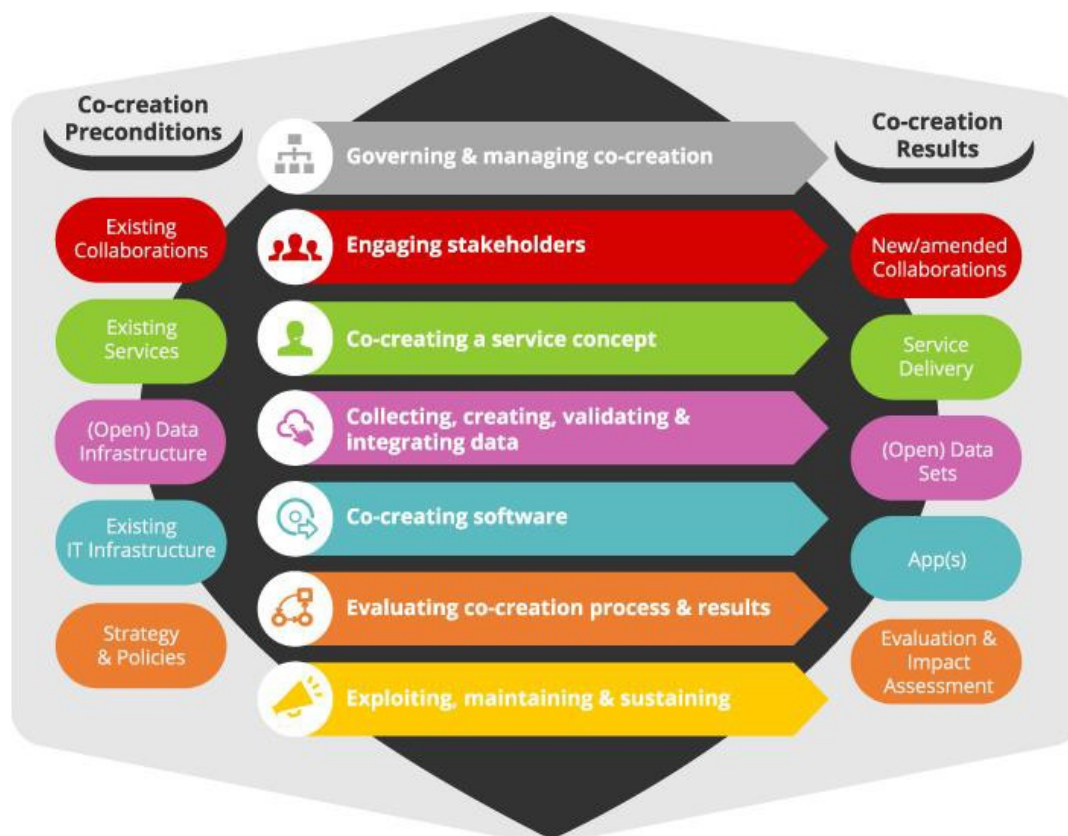


Figure 83: Mobile Age co-creation methodology

Co-creating information services

In addition, we argue that the challenges of co-creating digital services go beyond a restrictive culture and attitudes of civil servants, as we have to acknowledge, that the development of web-based services, which finally shall be integrated in eGovernment service platforms has to be compatible with procurement laws, tendering, interoperability requirements, budget constraints and other legal and organizational restrictions. Which services are developed is an issue of annual budgetary decisions. Individual citizens in participatory consultations may make proposals. However, real impact comes from big civic society players such as welfare organisations. Citizens may be involved again in the development process of particular government services according to the established methods of user involvement and participatory design. Case studies of such participation reveal several barriers on both sides: For government it is crucial not only to find volunteers involved but also to obtain a representative sample of clients of a particular service. Not every citizen is interested and willing to spend time in a design process of public services.

The review of Voorberg et al. (2015) mentions influencing factors such as social capital and the need that government explicitly invites, encourages and supports citizens in their roles in a co-creation process (see section 1.4.1). We agree with their conclusion that co-creation in its broader and more demanding sense is not automatically compatible with existing laws and established processes and for the selection and development of public services provided by governments. One additional barrier on the local level of government is a strong tendency of centralisation and standardisation to overcome the situation that the same services demanded by law are offered via dozens of different software solution by the respective local governments. One conclusion is that co-creation initiatives should avoid the standard public

services and focus on voluntary services in a legal sense, i.e. services they may offer without legally binding standards and interoperability requirements.

It is not surprising that it is these kinds of information services that have been developed in Mobile Age and it is these services that seem most promising.

Allowing for creativity

The openness of the processes in Bremen and South Lakeland allowed for creativity and left room for the older adults to explore their own ideas.

As we have argued above, this comes at its own costs in terms of ensuring the sustainability of the outputs of a co-creation process. What we would like to argue here, is that public authorities need to invite citizens to participate and engage, but they also need to allow for space to become creative. In order to allow for this, such processes need to receive sufficient resources.

7.3 Challenging civic engagement with open data

The re-use of open government data is part of the core objectives for civic co-creation projects (see section 1.4.3). Yet it is also one of the most demanding ones with respect to engaging older citizens. Working with (open) data entails number of activities: 1) As part of the service co-creation categories and objects of interest need to be defined. 2) A survey about existing data concerning these objects needs to be conducted and their completeness need to be assessed. This may lead to the collection and validation of data that have been identified as relevant but are not yet open or need to be collected across various data owners. 3) Subsequently, attributes for the objects need to be defined and data for these attributes collected; 4) missing data needs to be collected and created. A further activity may include the creation and integration of new (open) data by the core project group and co-creating older citizens. Lastly, the service and collected data need to be presented in a meaningful way to users. Editorial work (such as descriptions about data objects) is necessary. Below we provide an overview table about the types of methods we have used in our five co-creation processes. One of the main methods for engaging senior citizens in Mobile Age with open (government) data were walking workshops as conducted in Bremen Hemelingen and Zaragoza. In South Lakeland, it has been the demonstrator app (as a technology probe) to allow participants to create data (take pictures of events announcements and upload them).

Table 19: Overview methods per field site for working with (open) data

Bremen Osterholz	Bremen Hemelingen	South Lakeland	Zaragoza	Thessaloniki
Focus groups Workshops on informational content Data tables	Walking workshops Content creation workshops	Stakeholders meetings Probes	Data collection documents Walking Workshops	n/a

In contrast to popular discourse which argues that open government data are available for civil society to use (see also chapter 1.3.2), we had to realise that either

- **very little data is available on the content identified as most relevant by our participants** (social, cultural, leisure activities) as in the case of Bremen Osterholz;

- **data is available, but lacking the necessary attributes to make it meaningful** as in the case of South Lakeland
- **relevant data can be created by older adults** themselves as in the case of Zaragoza.

In Zaragoza as well as Bremen older adults engaged in the collection and creation of data. In chapter 1.4.3.1, we introduced different modes of civic engagement. In the context of the co-creation of digital public services for older adults, we can clearly state that the first and second mode are not appropriate as most of the data that is relevant is not available as open data (or at all). The collaborative map service as used in the co-creation process of Zaragoza, is an example for the third mode: civic issue tracker. Here citizens were encouraged to detect failures in the physical infrastructure of their neighbourhood or could make recommendations for improvement. In particular, in Bremen Osterholz, Bremen Hemelingen and in Zaragoza, open data was co-created with the participating older adults and hence the fourth mode was implemented (participatory open data).

As a result, co-creation processes need to take into account that information identified as relevant may not be available as open data and plan ahead to collaborate with various data owners (e.g. service providers). They need to allow sufficient time for data creation and curation during co-creation processes. In addition, suitable methods for collecting and creating data as well as user-friendly interfaces to digitizing these data are important.

In sum: There is a tension between data-driven app development and citizen-driven service co-creation as much of the information identified as relevant in co-creation processes is not available as open data. We are convinced that effective and relevant services for older adults should not be driven by what data is available, but rather have to be based on the needs and requirements of the target audience.

7.4 Policy implications

7.4.1 Co-creation and open government data

From the literature review, our own survey of co-creation projects as well as our own experiences, we find that open government data play little role in the co-creation of digital services for (senior) citizens. The data used in these services either come from state owned companies such as local transport companies and are provided exclusively for the respective project and not made open to the general public under free licences or links are made to sites like Open Street Map. There is a huge gap and mismatch between the data provided on governmental data portals and the data needed for citizen-centred public services. The main reason is that governments on all levels select those data for provision on their portals that are „low hanging fruits“, i.e. easy to provide in technical terms and easy to describe with meta data without considering future re-use. The Open Data Community supports this kind of open-end philosophy with the argument that government cannot judge the relevance and not foresee if somebody somewhere has an innovative idea for re-use, therefore any non-personal data shall be published: open by default. We have argued elsewhere that this is a very expensive and not efficient philosophy and proposed an “open by demand” regime as laid down in the Freedom of Information Act of the Bremen (Kubicek, 2017).

(Khan & Foti, 2015) in their review of national open government action plans criticise that in many countries there are no mechanisms to consider and strengthen demand for open data, no public prioritisation mechanisms and that there is the danger of „open washing“, when the increase of the number of published data sets is the main objective and success criteria.

However, if there is a prioritisation mechanism and citizens-centricity is taken seriously, as argued in chapter 1.3.1 (*from administration centric to customer-driven service development*), the complexity of data management becomes apparent. A co-creation process can start with a certain data set on a local government data portal, e.g. benches and public toilets. Citizens involved in co-creation may ask for safety relevant information as attributes, such as quality of the routes, road works, lightening and many more. Most likely, these data will not be openly available at this time and request processes have to be started for each attribute. Most likely, some of these data are owned by different government departments, others by state owned companies and some may not even exist in digital form.

In a „normal“ service development process it is most likely that some requirements simply are dropped because it takes too long to get the data and data generation is not planned for in the process. However, **the pledge to citizens-centricity require additional engagement in acquiring or producing data** for attributes, which are considered relevant and produce the additional value of the co-creation approach. **These data need to be maintained** after the process finishes.

For the Mobile Age project, this meant that we had to take into account that the co-creation of services by the field sites became more complex and took more time to acquire or produce suitable data that allowed satisfying the content and user requirements that citizens articulated in these processes. We tried to avoid rejecting requirements with the argument that desired features cannot be implemented because appropriate data were not available. Rather, if citizens emphasised the importance of certain features we extended the action plan for defining, collecting and integrating the respective data.

Our study confirms some of the insights proposed by Sieber and Johnson (2015) as well as Lee et al. (2015) in the civic tech context: **Government should take a larger responsibility for controlling the re-use of its data for the co-creation of public services**. This implies to establish mechanisms for co-operation between government agencies, app developers and (older) citizens as co-creators. In particular, governments should:

- Establish a request function for open data and prioritization consultations.
- Conduct consultations on the improvement of existing and the demand for additional public services for different groups of citizens, e.g. in the context of smart city initiatives, in particular for senior citizens in the context of age-friendly cities initiatives.
- Establish longer lasting ways of co-operation with civic tech activists and to align them with citizens as co-creators.
- Assign the task of intra-governmental data provision management or even inter-organisational data management when data are needed from different departments and state owned or regulated entities.
- Prepare for the integration of the services into the governmental service portal.

7.4.2 Co-creation of sustainable digital public services

Not every eGovernment service is equally suited for co-creation. With regard to the readiness of government employees and the objective legal and technical discretion as well as the relevance of the knowledge and possible contributions of citizens as co-creators, local information services should be given first priority. In particular, Mobile Government offers many opportunities where either printed information or static websites can be improved by apps for mobile devices and meet the promise of anytime-anywhere-access to needed information.

In order to identify services that justify the efforts of co-creation we recommend to plan four steps, 1) broad consultation for the collaborative development of proposals for the improvement of information services on different topics, 2) a formal and official selection of a specific service and the allocation of resources for co-creation, 3) the co-design process itself, and 4) a systematic evaluation in order to assess the success of the co-created service and to learn for the next co-creation adventure.

Regarding the recruitment of co-creators a decision has to be made whether there shall be a permanent group covering all the different phases or several phase specific groups with the varying competences. There are advantages and disadvantages of both options. It depends on the kind of service and the kind of target audience. For local information services we recommend to engage a permanent group with a predefined mix of different but complementary competences and capabilities.

Successful co-creation needs professional moderation and facilitation, employing the appropriate methods for the respective target groups and subject area. In most cases this cannot be provided by the government employees responsible for the subject area or policy field. Rather external moderators should be hired as a third party. They can choose the best methods and guarantee for the fairness and transparency of the process, where government is perceived as a stakeholder with his own interests.

In order to justify the resources needed for a successful co-creation process a broad online consultation on a range of possible services should be carried out first for selecting the service with highest priority and concerns. Only then a co-creation process should be started.

Co-creation may become a way to improve the lack of user-centricity and user experience of eGovernment services. However, there is no guarantee for its success. It is a complex multi-task and multi-stakeholder process, more demanding than traditional citizen participation. Our own research on success factors of citizen participation has identified three success factors: (1) a problem of high concern to both sides, government and citizens, (2) professional facilitation, and (3) sufficient resources. We are convinced that this is also the case for co-creation processes of eGovernment services. It is not easy to meet these requirements in times of a mismatch between the many needs for services in the public interest and low public budgets. However, a low budget for co-creation activities, that does not allow to meet its promises and the desired results is wasting resources. If the necessary full personal and financial commitment is not there, it is better not to start. Due to the openness and flexibility inherent to any co-creation process, providing guidelines and recommendations for such a process is a contradictory and therefore challenging task. However, the lessons learned in the Mobile Age project, laid down in this study, and the upcoming interactive guidebook provide a corner stone on the way to better, more user centric public services and the promises of open government. Each process is a journey in a partly unknown land, and an adventure. We can all profit from travel reports. Therefore, it is important that future co-creation processes are evaluated and the lessons learned will be published so that our knowledge about this new journey will be co-created as well.

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APPENDIX A:

9 Methods for engaging co-creators

D1.5 Final study on co-creation practices

<i>Method</i>	<i>Description</i>	<i>Purpose/objective</i>	<i>Task of researchers/co-creation manager</i>	<i>Time expenditure</i>	<i>Limits</i>	<i>Indicative literature</i>
Semi-structured Interviews	A partly structured conversation between a researcher and a respondent, where the researcher guides the conversation according to her or his research question but at the same time is open to unexpected topics that might be of interest.	To collect data about prospective services, users and stakeholder, co-creating knowledge, identify needs, visions, expectations, (design-) problems through a confidential conversation between researcher and respondent.	Create a natural and comfortable environment, prepare a guideline	Time intensive	No generalisation possible, knowledge that cannot easily be verbalized might not be captured	(Thorpe & Holt, 2008; Myers & Newman, 2007; Bogner, Littig, & Menz, 2009; Flick, 2014)
Focus Groups	A focused discussion led by a moderator through a set of questions on a specific topic. Focus groups can be newly created groups or pre-existing groups consisting of 6-12 persons who share a common interest	Collect data about prospective services, users and stakeholder, co-creating knowledge, identify needs, visions, expectations, (design-) problems through stimulating statements through the interaction in the group.	Create a natural and comfortable environment, moderate	Time intensive	No generalisation possible, cautious group members might not get heard	(Kamberelis & Dimitriadis, 2013; Rodriguez, Schwartz, Lahman, & Geist, 2011; Stahl, Chiarini Tremblay, & LeRouge, 2011)
(Media-) diaries	Participants are provided with a diary to record their experiences, feelings, impressions during the use of a device or application and/or before or after the use. The diary can be a booklet, an application or a voice recorder.	To collect temporal and longitudinal information gathered in a natural context of the interaction and to get insights in the impression of a specific device, usage of features, technological acceptance, emotions associated with task performance, or learnability of an application.	To provide media diaries, motivate and explain their use and ensure their return	Low expenditure of time	Requires high motivation on the participants side, there is low control of the process, data is prone to distortions	(Lallemand, 2012; Palen & Salzman, 2002)

<i>Method</i>	<i>Description</i>	<i>Purpose/objective</i>	<i>Task of researchers/co-creation manager</i>	<i>Time expenditure</i>	<i>Limits</i>	<i>Indicative literature</i>
Participant-observation	Observing and recording people and their activities and interactions. Participant observation involves active engagement in activities in contrast to observation where researchers simply observe without interacting with people.	To collect information on people's activities and interactions and thereby get insights in the behaviour of people and their interactions in a group or with a technology. Observations can also be used to learn about collaborative design activities to learn about resources and obstacles for participatory design.	In participant observation the task is to observe attentively while being involved in the activities and interactions and to take notes while or after the activities	Time intensive	The researcher is part of the object of study and influences the situation, participants may feel uncomfortable and behave differently	(DeWalt & DeWalt, 2002; Adler & Adler, 1994; Tang & Leifer, 1991)
Cultural Probes or Design Probes	Tools including descriptive and exploratory tasks that are (typically) based on self-reporting, are handed over to the participants. Participants collect data on themselves, their lives and culture. Briefing and follow-up interviews are conducted to prepare and accompany the process and a de-briefing session to supplement, validate and explore the data	Collect data about prospective users and stakeholder and their daily contexts, sensitizing the participants to observe, reflect upon and report their experiences, stimulate imagination of the researchers	Provide proper tools, brief the participants, organize follow-up interviews	Time intensive	No generalisation possible, no concrete insights in design solutions	(Mattelmäki, 2006; Gaver et al., 1999; Mattelmäki, 2005; Boehner et al., 2007; Boehner, Gaver, & Boucher, 2012)
Survey	Collect data through surveys	To collect data on a large amount of people and thereby identify general needs of a large group of people	To develop and diffuse a questionnaire	Relatively low expenditure of time	Due to the standardisation a deeper understanding of needs is not possible	(Flick, 2014)

<i>Method</i>	<i>Description</i>	<i>Purpose/objective</i>	<i>Task of researchers/co-creation manager</i>	<i>Time expenditure</i>	<i>Limits</i>	<i>Indicative literature</i>
Personas	A persona is a representation of a fictitious user that includes a concise summary of characteristics of the user, their experience, goals and tasks, pain points, and environmental conditions. Personas describe the target users of a tool, site, product or application, giving a clear picture of how they are likely to use the system, and what they expect from it. Personas are user models developed on the basis of qualitative research data and/or the expertise of involved stakeholders.	A persona allows the designers of an interface to consider the needs, wants, expectations etc. of wider user groups, without involving them directly in the design process. By drawing attention to potential users the creation of a common understanding of the users is supported and designers are engaged to implement this understanding in their design decisions	To identify the significant and meaningful patterns in user behaviour based on research data, to encourage participants to imagine needs, problems, interests, wishes, skills and expectations of other potential users	Time intensive (data has to be gathered)	As models personas are likely to generalisations and stereotypes	(Cooper, 1999; Cooper, Reimann, & Cronin, 2007)
Scenarios	A scenario is a description of a particular situation of (potential) use of a design to predict or explore future use	To provide information about the context in which a system has to operate, in a user- and task-oriented way, to foresee and consider future use cases including problems, conflicts etc.	To identify relevant situations based on research data and to encourage participants to imagine relevant situations	Time intensive especially when involving multiple stakeholders	By forecasting and planning scenarios of use, the use of scenarios for design is prone to predict futures and thereby constrain possible use	(Rosson & Carroll, 2002; Carroll, 2000; Alexander & Maiden, 2004)
Walking workshops	Designer and participants walk together through e.g. a neighbourhood along a jointly planned route visiting locations of importance. The walk can be documented and facilitated with maps, interviews, videos and/or photos. After the walk, a debriefing session should be conducted.	To trigger problem identification and idea generation, get to know a neighbourhood (resources, problems) from a participant's point of view and to inspire dreams and ideas. To overcome traditional interviewer/interviewee power relation. To collect data	Prepare and facilitate the walks with artefacts, debrief	Time intensive	Not applicable for a whole district	(Kanstrup et al., 2014)

D1.5 Final study on co-creation practices

<i>Method</i>	<i>Description</i>	<i>Purpose/objective</i>	<i>Task of researchers/co-creation manager</i>	<i>Time expenditure</i>	<i>Limits</i>	<i>Indicative literature</i>
Future Workshops	Group session where small groups of participants verbalize their desires, dreams, and fantasies to generate ideas about the future (e.g. future workshop) and/or collaborate on the development process (e.g. design workshop)	To enable a group of people to develop solutions to social or technological problems by criticizing the current situation, generating visions on how to solve the problems, conceptualizing and designing feasible solutions collaborative.	Moderation, documentation and visualisation	Time intensive	The method may raise high expectations	(Biskjaer, Dalsgaard, & Halskov, 2010; Jungk & Müllert, 1996; Kensing & Madsen, 1991)
Storytelling	Participants jointly create fictional and/or real life narrations on a given topic or theme. The narrations can be inspired through scenarios, cards, pictures e.g.	To envision situations without the boundaries of current technology and practices.	Moderation, documentation and visualization	Time intensive	The method may raise high expectations	(Sanders, 2000; Parrish, 2006; Wilkins, 2004; Gruen, 2000; Kankainen, Vaajakallio, Kantola, & Mattelmäki, 2012)
Card based design	Cards on technologies and domains for use are explained to the workshop participants, the participants collaboratively combine the cards on posters in order to capture design concepts and the posters are discussed.	Enhancing creativity through providing inspirational materials and thereby developing design concepts	Provide cards, moderate and document the process	Time intensive (especially when cards are self-made)	Senior citizens may feel they are not taken seriously	(Biskjaer et al., 2010; Halskov & Dalsgård, 2006) [42]
Data Tables	The data model defines what information has to be provided for each real life entity. A data table is a matrix with lines for the real life objects and columns for the respective attributes.	To provide the informational content and allow for checking and improving completeness and harmonization, similar data for all attributes of every object of one category	To ensure that all relevant stakeholders are included in the data collection and validation	Time intensive, but effective for aggregating data across various stakeholders	If not all relevant data are available a low-tech option to include stakeholders.	

<i>Method</i>	<i>Description</i>	<i>Purpose/objective</i>	<i>Task of researchers/co-creation manager</i>	<i>Time expenditure</i>	<i>Limits</i>	<i>Indicative literature</i>
Data Profiling	Data profiling is the process for generating useful meta-level information about a given dataset / database.	To provide descriptive information containing detailed information on values, attributes, dependencies and other relationships in data.	To define metrics, extraction algorithms, and representation models for profiling information.	Depends on the size of data	Profiling is generally a computer intensive process and it is challenging to do it a computational efficient way.	(Abedjan, Golab, & Naumann, 2015; Ellefi et al., 2016)
Quality Assessment	The process of validation of data (or the thing in concern) to ensure that it conforms to the quality requirements.	To ensure quality of data and its fitness for a given use case.	To define how to measure, and represent quality.	Depends on the size of data	Quality assessment is subjective, one dataset may be considered having high quality by one but low quality by another.	(Zaveri et al., 2016)
Datathons	Events in which participants (mostly software developers, but may also include other type of professions) collaborate intensively in a relatively short period to produce software artefacts using the set of data provided.	To identify who will use the data, how they use the data and get feedback from them regarding the data provided.	To spread the news about the event, to facilitate a venue during the specified time, to provide the datasets to be used during the datathons.	Time intensive	Requires high motivation on the participants side and cost-intensive both for the organisers and the participants.	-
Data transformation tools	Tools to transform data from one format to another.	These tools help to transform data that is normally in legacy format (such as relational database) into a format that is more suitable to be published, consumed and integrated into the web, (such as RDF or JSON-LD)	To create mappings that specify the relationship between the original format and the published format.	Depends on the size of data	Researchers have to be familiar with the mappings specification.	(Sahoo et al., 2009)
5-star deployment scheme	A scheme that ranges from one star to five stars depending on the deployment of open data.	To measure how well data are integrated into the web.	To publish the data according to the best possible scheme.	Depends on the size of data	The better the scheme, the more efforts required.	(Berners-Lee, 2006)

<i>Method</i>	<i>Description</i>	<i>Purpose/objective</i>	<i>Task of researchers/co-creation manager</i>	<i>Time expenditure</i>	<i>Limits</i>	<i>Indicative literature</i>
Kanban-Boards	A Kanban-Board is a method to visualize the workflow within agile software development. It consists of cards containing tasks and their estimated effort which are pinned on swim lanes to show their status (usually: backlog, planned, work in progress, testing, done).	To provide a common understanding of tasks during development by visualizing them on the board, to limit tasks worked on concurrently and to measure and manage workflow to make informed decisions and visualise consequences. Thereby support transparency in agile development to ensure that all relevant stakeholders are at all times informed about the status of the work and resource allocation.	To thoroughly maintain the board and to provide realistic time effort estimations.	Not very time intensive and very effective for communication of resource constraints and prioritization.	Big tasks must be divided in small chunks, which must be explained to some stakeholders. Does not guarantee that particular tasks are done in time.	(Boeg, n.d.)
Paper prototyping	Creating user interface prototypes on paper either drawn or by combining given printed elements.	To discuss applications user interfaces and possible user interactions.	Prepare materials such as paper, pencils or templates. Consult on common usability concepts.	Time intensive (especially, if printed elements are not cut out beforehand)	Interaction is abstract.	
Rapid mock up creation	Creating digital user interface prototypes, either by a specialized tool or by rapid prototype programming.	To discuss applications user interfaces and possible user interactions. Useful for refinement of the findings from paper prototyping.	Prepare prototypes. Consult on common usability concepts.	Time intensive in preparation, but can be very effective, if customized whilst discussion.	Full functionality cannot be shown	
Agile development	Iterative development of software using a concept of evolutionary change. In each development cycle the software gains new functionality or existing functionality improves.	To show the stakeholders results early to discuss and refine it and support of using the Kanban management methodology.	Correctly plan, what functionality will be ready for review and document design decisions. If applicable, maintain the Kanban-Board	Relatively low expenditure of time.	There will always be the risk that functionality considered as ready is not.	(Boeg, n.d.)

<i>Method</i>	<i>Description</i>	<i>Purpose/objective</i>	<i>Task of researchers/co-creation manager</i>	<i>Time expenditure</i>	<i>Limits</i>	<i>Indicative literature</i>
Functional testing	Manually or automatically testing functionality. If performed by Co-Creators done manually.	Ensure that the software is working properly.	Prepare questionnaires, analyse results.	Depends on questionnaires granularity.	ISO 9241 is considered for an office situation and has to be adapted.	
Usability testing	Testing the usability by asking users about their impressions on particular dimensions (Suitability, Self-descriptiveness, Controllability, Expectancy-conformance, Error tolerance, Suitability for individualization, Learnability) after using a software.	Ensure that the software is suitable to fulfil its tasks whilst being easily to learn, understandable, easy to use (Fulfilling the requirements of ISO9241: Ergonomic requirements for office work with visual display terminals (VDTs), Part10: Dialogue Principles).	Prepare questionnaires, analyse results.	Depends on questionnaires granularity.	ISO 9241 is considered for an office situation and has to be adapted.	(ISO 9421-10, 1994)
Acceptance testing	Testing the level of acceptance, that software gets by its users.	To ensure before publication that the software additionally to usability aspects has an acceptable meaningfulness, performance, data integrity, reliability and security. Can be done in form of a beta-test with a bigger number of users.	Prepare questionnaires/ maintain feedback channel, analyse results.	Depends on questionnaires granularity / test user feedback.		(Hambling & Van Goethem, 2013)

Table 20 : Description of co-creation methods

APPENDIX B: Documentation templates

Diary template for co-creation activities

Activity stream	
Event/Type of activity	
Date	
Length	
Location	
Participants	
Intended goal/researchers agenda before intervention <i>Describe your intention/goal when setting up/planning for the interventions.</i>	
Activities/tasks <i>Describe how the intervention was conducted.</i>	
Observation notes <i>Note anything noteworthy about the event. Things that you surprised you, what worked well or not so well.</i>	
Reflection <i>Reflect on what worked well, did not work well with respect to your objectives/goal. Please also reflect on any decisions, deviations, plans for amendment or change.</i>	

Decision log for technical development

Name:	Decision
Description:	Brief description of topic (functional requirement, design feature)
History:	Causes and background of the need for a decision need
Available Options:	List of options with risks and benefits
Recommendation	Rationale for preferred option
Feasibility:	Time and resources needed
Decision:	Selected, recommended option

Next Steps:	Actions, which arise from the decision
-------------	--

APPENDIX C

Appendix includes additional information (if applicable) at the end of the deliverable. If more than one is necessary, "Appendices" are listed separately. They support the text, although they include less important information (graphics, tables, images, questionnaires, etc.) that the reader may refer to if he wants.

10 Open data in Mobile Age

The reports on the data workshops and data tables are just two examples of methods employed in Mobile Age to engage citizens in working with (open) data. All but one co-creation pilot sites (Zaragoza) noted in their Senior Citizen Engagement Reports (D3.2-D3.5) how difficult it was to obtain the data that was supposedly ready at hand (see chapter 1.4.3 on civic hacking). In addition, in four pilot studies we realised that in order to develop services that are meaningful and relevant to older adults, they need to create and collect additional data. In Zaragoza and Bremen for example through data workshops.

Below is a summary of the open data as used in each of the co-creation processes.

D1.2 Final study on co-creation practices

Field site	Bremen Osterholz	Bremen Hemelingen	South Lakeland	Zaragoza	Thessaloniki
Open data					
Open data use	Benches Public toilets Water quality for lakes/swimming spots Fishing spots Parks etc.	Benches Toilets Parks etc.	Yes, data sets on: Public transport Weather Directions and reachability Amenities, facilities and points of interest Map location search (geocoding) Local events Local volunteering opportunities Local services	Senior centres Sports Facilities Pharmacies Proximity to equipment Parks Elderly Friendly Shops public toilets retirement homes monuments healthcare centres markets Stops, times, bus lines taxi disability parking bicycle lanes traffic status events in the city procedures and services bereavement services	Pharmacies and open hours Hospitals and open hours Doctors per specialty
Data creation ⁹					
(Co-)creation of data	Yes, creation of not yet existing data sets on: Nice places and walks complementary data creation on: Institutions Benches Public toilets	Yes, creation of not yet existing data sets on: walks complementary data creation on: Benches Public toilets	Yes, photographs of posters and notices of local events supplied by the users of the app	Yes, data on barriers/accessibility of roads	No

⁹ Here we refer to data created within the project. Crowdsourced data from external data providers are classified as either open or other data

Other, non-open data					
Other data used	Public transport City guide on accessibility Printed district guide District reader	Public transport City guide on accessibility Printed district guide Restaurants Street lights	No	No	No
Data owner	Local government OSM Public transport association Government funded project Private Website City web portal and other Websites	OSM Public transport association Bremen/Niedersachsen (VBN) Government funded project District marketing Local Government Private company	n/a	n/a	n/a

Table 21: Data use and creation

APPENDIX C

11 Outputs and outcomes in Mobile Age

11.1 Bremen Osterholz

11.1.1 Output

There are three kinds of output of the co-creation process of an interactive digital district guide for Bremen-Osterholz:

- data collected and presented in the guide,
- an app providing access to these data,
- an online service in which data and app are embedded and that is offered by a service provider that takes care of the maintenance according to a business model.

As it has been described above the guide contains all points of interest in the district relevant for senior inhabitants. The list has been checked with several experts and nobody mentioned something missing. It includes 17 nice places and 75 organisations relevant for senior citizens.

During the co-creation process a first demonstrator app has been developed by the technical partner with the participation of the co-creator-core-group and tested with a few experts. Figure 59 shows the start page of the demonstrator.

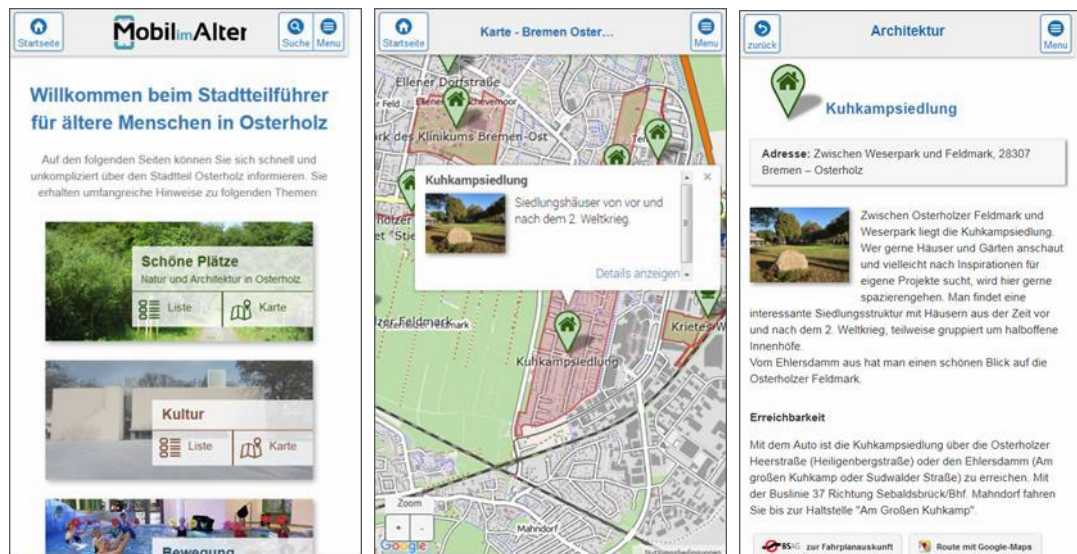


Figure 84: Start page, map page and detail view of the phase 1 demonstrator

In English translation:



Mobil im Alter - District Guide Bremen Osterholz

Phase 1 demonstrator prototype application

Field site: Bremen

Welcome to the district guide for older adults in Bremen Osterholz. With the following app you can inform yourself quickly and easily about the district Osterholz. You will receive extensive information on the following topics: Beautiful places of nature, interesting architecture, culture places, sport and exercises, meeting places, advisory boards and help desks in the district of Osterholz.

The demonstrator is available at <https://Mobile Age.ftb-esv.de/osterholz>

On the 9th of February 2018 the data have been migrated into the official city portal www.bremen.de and became accessible via an HTML5 application according to standards of this portal in the section of living and dwelling in districts as a separate service for senior citizens. It is accessible there via www.bremen.de/osterholz/senioren

Below are screenshots of the same content in the adopted design

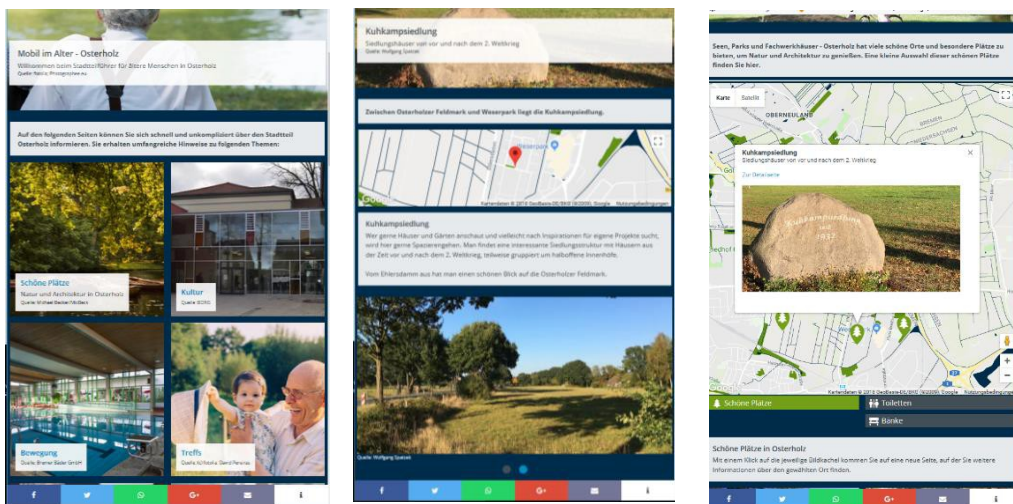


Figure 85: Start page, map page and detail view of first phase app as part of the official city portal

Bremen.online (www.bremen.de) is the official city portal, in which the data and the app are embedded and that takes care of the maintenance of the data and possible extensions.

11.1.2 Outcome

Outcome is the use of the output. The demonstrator app has only been communicated for testing purposes. Access figures are thus limited and low.

The first version of the demonstrator went online on the 15th of May 2017 and was continuously improved throughout our fieldwork. Log files between the start date and the 11th of January show the following statistics.

During the time a total of 999 visits were registered from 673 different visitors. 33 per cent of these visits (326 visits) were one-time visitors. About 9 per cent (90 visits) were two-time visitors. 37 per cent of all visits are accounted by visitors that visited the application Website more than 10 times.

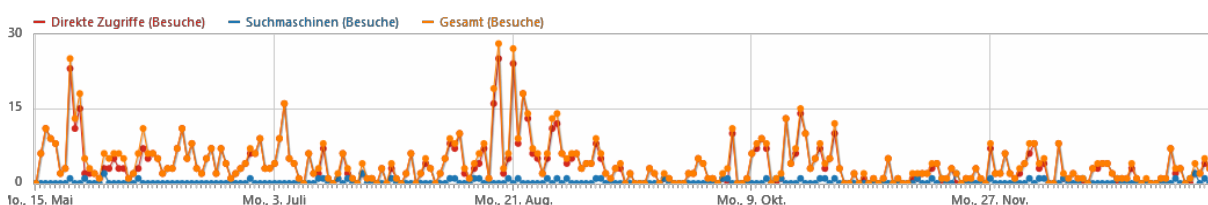
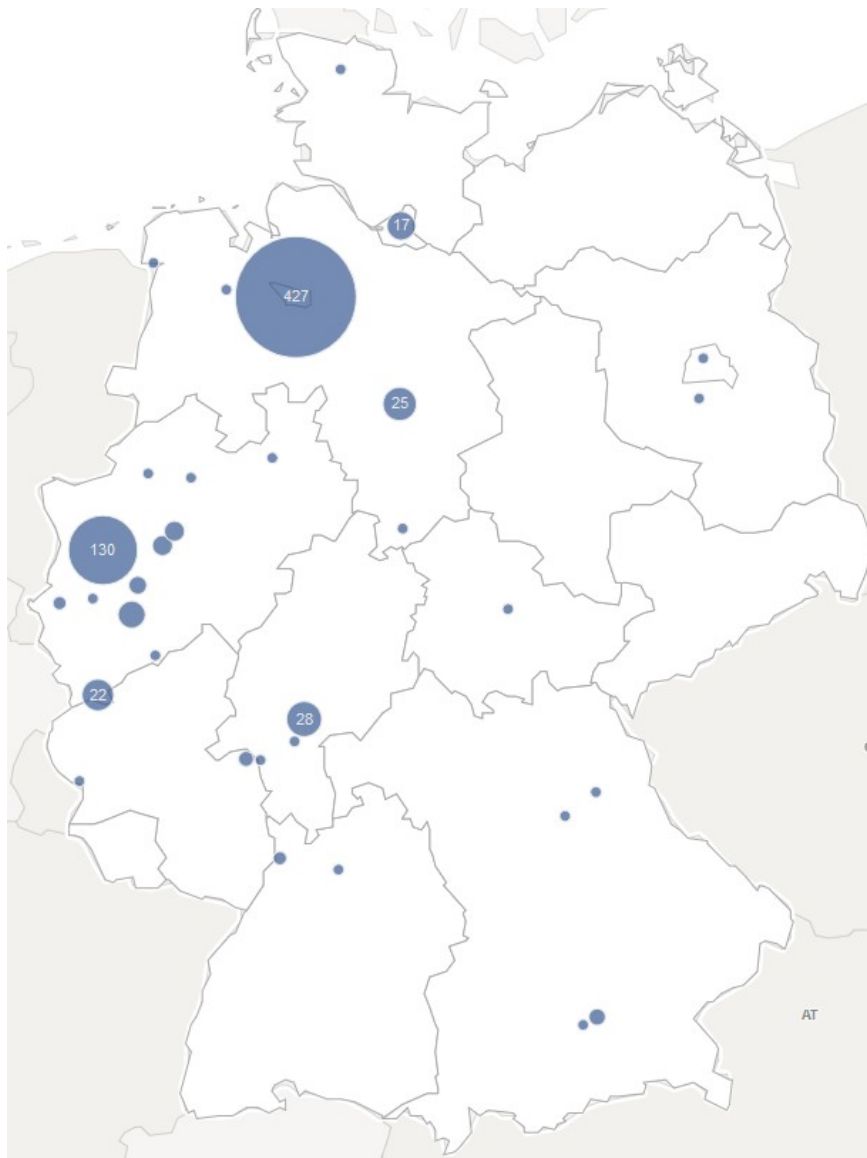


Figure 86: Number of visits on phase 1 demonstrator

Most visitors came directly to the page (red line). A limited number were directed via the home page of the local district council (#13), the ifib webpage (#6) and the personal home page of one of the researchers

(#5). Very few people were directed via Search engines (blue line). These numbers are expected to significantly increase once the service has been migrated to www.bremen.de and communicated via local newspapers and TV.



The figure on the left hand site, provides an overview of the number of visits per city/region. Most visits came from Germany (#947), with the majority from Bremen (#427) and Moers (#130). The technical partner FTB is located in Wetter (#7). Other cities with higher number of visits include Niddtal (#28); Lehrte (#25); Blankenheim (#22); Hamburg (#17); Cologne (15).

229 visits could not be assigned to any city.

On average, visitors spent 3 minutes and 44 seconds on the prototype Website with 917 visits to the index page. The second most popular page (#423) is the category about “nice places”, followed by “culture” (#257) and “meeting places” (#161).

Figure 87: Number of visits per city/region

11.2 Bremen Hemelingen

11.2.1 Output

There are three kinds of output of the co-creation process of an interactive digital district guide for Bremen-Hemelingen:

- Data collected and presented in the guide.
- An app providing access to these data.
- An online service in which data and app are embedded and that is offered by a service provider that takes care of the maintenance according to a business model.

As it has been described above the guide contains seven neighbourhood walks. Below we provide some screenshots of the demonstrator.



Mobil im Alter – Bremen-Hemelingen

Phase 2 demonstrator application

Field site: Bremen

Welcome to the district guide for the elderly in Bremen Hemelingen. With the following app you can inform yourself quickly and easily about the nice walks and interesting places in the district of Hemelingen. You will receive extensive information and suggested routes for walks and insider knowledge of interesting locations in the district of Hemelingen.

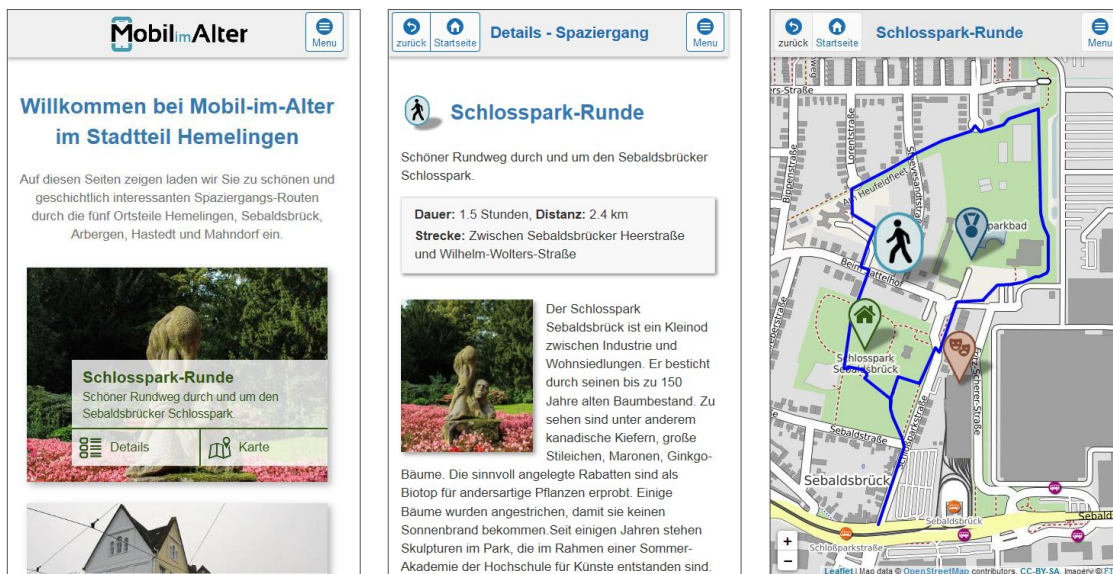


Figure 88: Start page, detail view and map page of the 2nd phase demonstrator

Launch demonstrator:



<https://Mobile Age.ftb-esv.de/hemeligen>

11.2.2 Outcome

There are two main outcomes of the co-creation process:

- Several service providers have committed to conduct neighbourhood walks based on our digital district guide. These will also serve for maintaining up-to-date information

In two of the senior citizens' meeting places, tablet groups for older adults have been established.

11.3 Zaragoza

11.3.1 Output

There are four kinds of output of the co-creation process of friendly routes in Zaragoza:

- Data collected and presented in the catalogue of open data of Zaragoza (<http://www.zaragoza.es/sede/portal/datos-abiertos/servicio/catalogo/>).
- An online service called collaborative maps that access this data that has been used for the creation of user-friendly routes (http://www.zaragoza.es/ciudadania/gobierno-abierto/participar/listadoMapas_Aportacion).
- 2 different lists of improvements that should be considered by other municipal services through the complaints and suggestions service:
 - Street Lighting service
 - Public Cleaning service
 - Environment service
 - Urban Mobility. Public Transportation service
 - Urban Mobility: Traffic Light Regulation service
 - Urban Mobility: Signposting service
 - Urban Mobility: Cast Traffic Lights service
 - Parks and Gardens service
 - Town planning service
- Participation in participatory budgets (<http://www.zaragoza.es/sede/servicio/presupuestos-participativos/>).

In this first district, all improvements have been reported through the complaints and suggestions service of the city council and are currently in process.

During the co-creation process the collaborative maps service and the municipal older adults's website has been developed and improved to facilitate its use by older adults in terms of usability and accessibility.

The collaborative maps service follows the Web Content Accessibility Guidelines (WCAG) version 2.0 (<https://www.w3.org/TR/WCAG20/>) at level AA. Following this guidelines ensures that this service is also accessible to people with disabilities.

11.3.2 Outcome

Outcome is the use of the output. The collaborative maps of the friendly routes have only been communicated for testing purposes.

Since we started this project we have worked on our own collaborative maps service. The steps we have taken to develop these improvements have been:

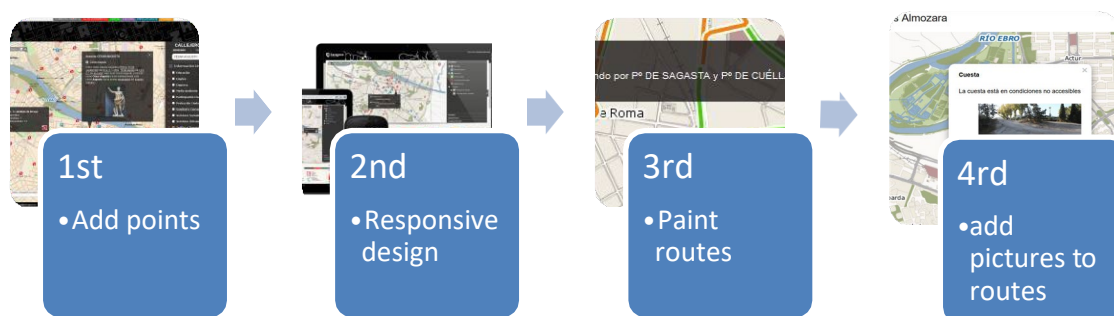


Figure 89: Development of collaborative maps service

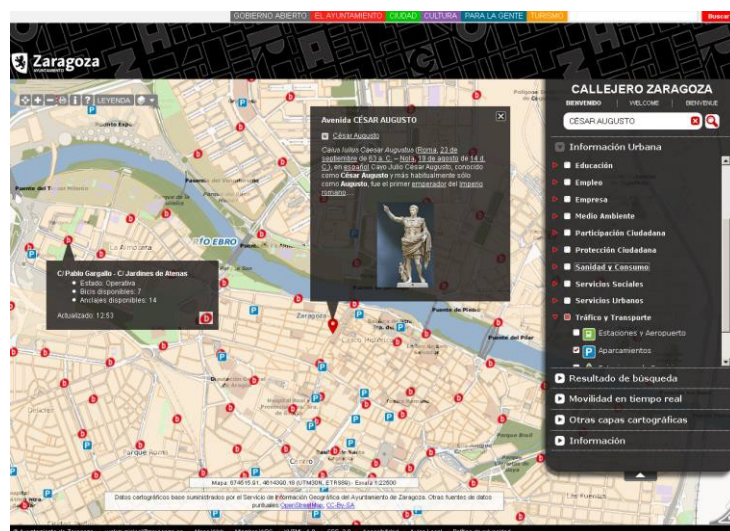


Figure 90: First version of the collaborative maps service



Figure 91: Responsive collaborative maps service



Figure 92: Painting routes in the collaborative maps service

Rutas Amigables Almozara



Figure 93: Adding pictures to the routes in the collaborative maps service

The complete first version of the collaborative map of this district (Centro) went online on the 7th of June 2017 and was continuously improved throughout our fieldwork. Log files between the start date and the 11th of April 2018 show the following statistics.

A total of 270 visits were recorded during the period, out of 47,265 registered visits to all collaborative maps service.

11.4 South Lakeland

11.4.1 Outputs

The output of the co-creation process in South Lakeland is a demonstrator that consists of a group of apps that we call the Mobile Age Social Connectedness Apps.

The Social Connectedness service concept:

The Social Connectedness apps were co-created with older adults to provide opportunities for them to enhance their social connectedness. What the app does is to seek to provide information about social opportunities, to identify data relevant to the enabling links that are crucial to access, and to

personalise this for each older adult through an individual profile. The profile also means that an older adult does not have to be the user of the technology, but can be the user of the service through an intermediary accessing it on their behalf. We outline these three components in more detail below. In relation to **open data** the service concept is to integrate open data from different sources combining data on events, services and volunteering opportunity provided by local organisations with open data on transport, maps and weather. What makes the social connectedness service special is the provision of the different types of information together, based on the information needs of the older adult users identified through the workshops – the **enabling links**. The Social Connectedness apps reduce the need for several individual searches to access, for example, events listings, travel options, weather conditions and routes. By using the **Older Adult User Profile** and the search functions in the app, the user has access to data that is relevant to their preferences, without having to search through a large number of entries. In this way, the Social Connectedness apps reduce the cognitive and logistic burden of accessing information on events that enable older adults to take part in events. Our aim with the Social Connectedness apps is to provide an information service tailored to the needs of the older adults in South Lakeland, helping to reduce barriers for engaging in social activities and stimulating social participation.

The graphic below illustrates the Social Connectedness Service:



Figure 37: Social Connectedness Apps Service Concept

The Mobile Age Social Connectedness Apps

The Social Connectedness apps co-created for South Lakeland Mobile Age have been described in detail in Deliverable D4.3. Below is a brief description of each one:

App launcher or portal

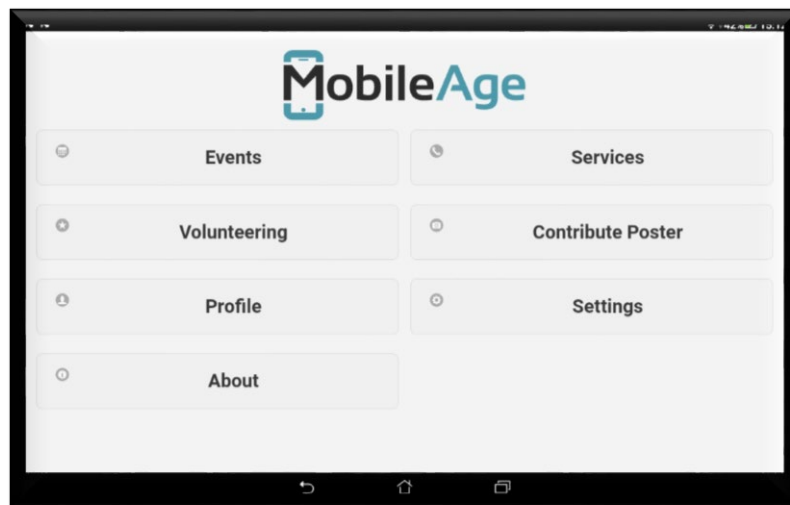


Figure 94: screenshot of the launcher

The launcher is the first screen that appears when the demonstrator application is opened, providing an interface for the user to access the application's internal apps from a single screen. The available apps are loaded as a list of buttons; pressing one loads and navigates to that app. The launcher also provides a framework for sharing functionality and data (such as user profile and analytics) across apps.

User profile manager

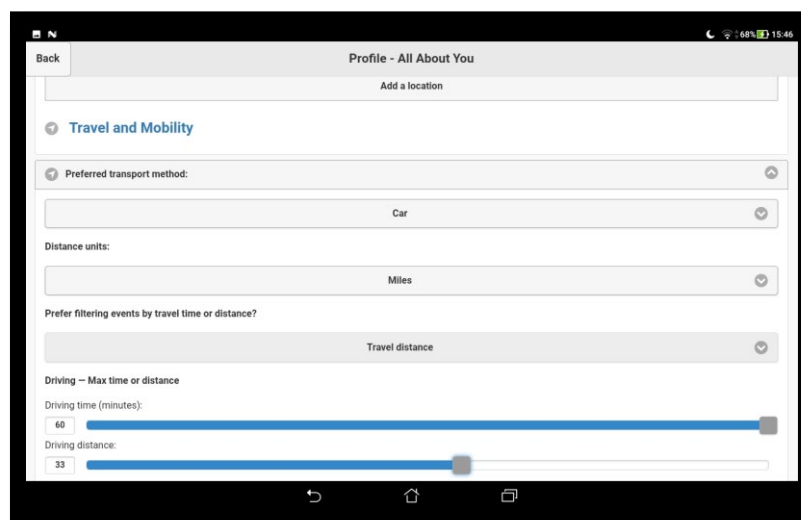


Figure 95: example of how data can be entered in the profile

The profile manager provides apps with access to a data container for the current user, which houses user data and preferences across the apps. Furthermore, the user's profile can be shared with people external to the Mobile Age application.

Events app

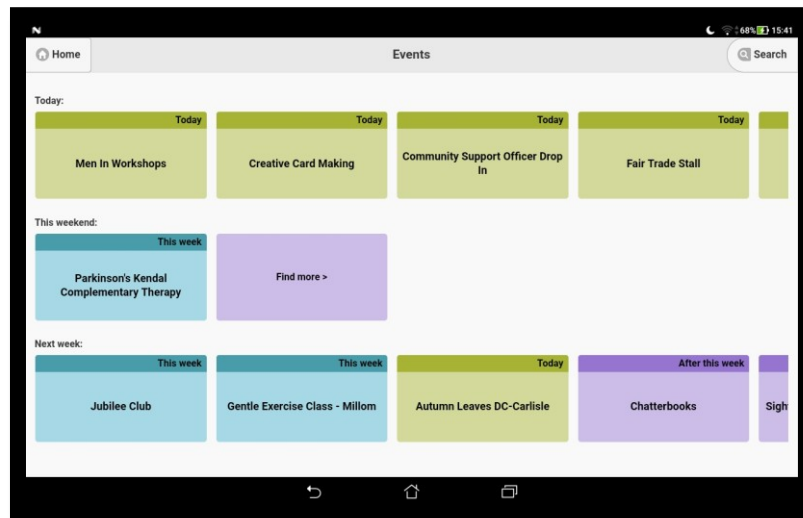


Figure 96: Screenshot of the opening screen of the events app

This provides access to information for social events in a user's local area. A primary intention of the South Lakeland demonstrator application is to reduce social isolation and loneliness. This app aims to reduce barriers to social- connectedness by providing information about social events and their accessibility. One of the mechanisms to achieve this is presenting serendipitous social events on the homepage of the Events app based on proximal features that are relevant to the user (e.g. showing groups of events for today, this weekend, nearby, and near home).

A search mechanism is also provided, allowing a user to search for events based on (e.g.) their location and reachability preferences, further supporting the ability to find events based on the user's accessibility.

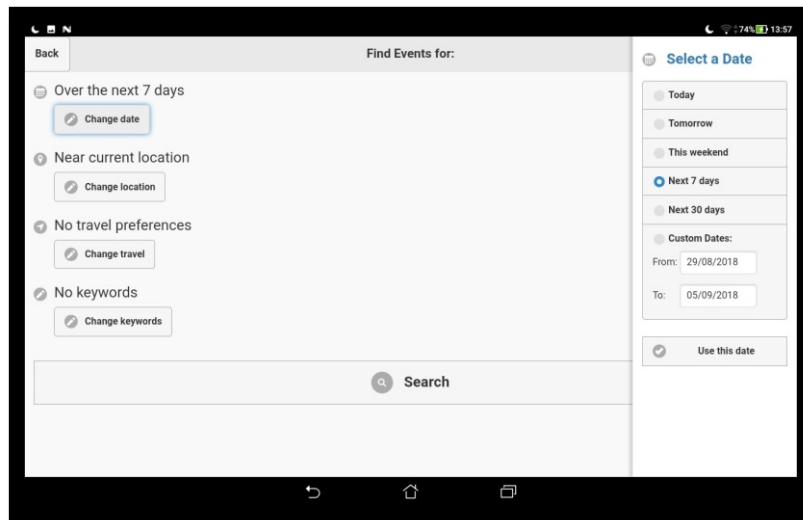


Figure 97: example of the search interface

Once an event is selected, it can be added to the user’s calendar, which allows the user to organise their schedule. Whilst viewing their chosen event, a user can request to view transportation options to the event, and also show routes to the event on a map in conjunction with other open data (including the location of nearby toilets and benches). This app is designed to function with limited network functionality by providing offline caching of nearby events, and where possible providing features that function when offline.

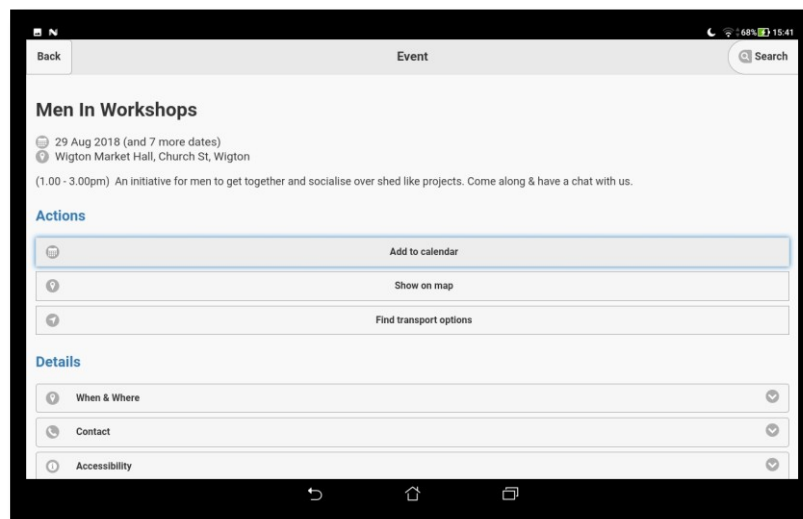


Figure 98: screenshot of a selected event information screen

Maps

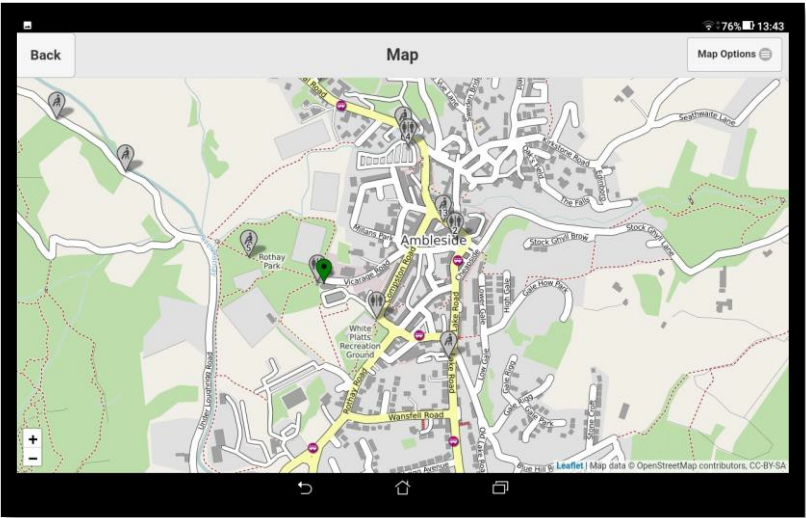


Figure 99: Map showing an event in Ambleside, indicating the location of benches, toilets and bus stops

Transport options

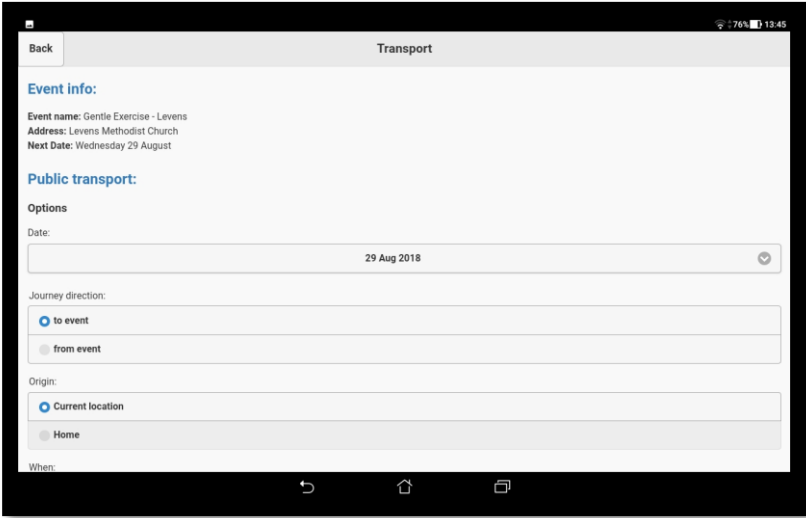


Figure 100: interface to choose the parameters of the transport option search

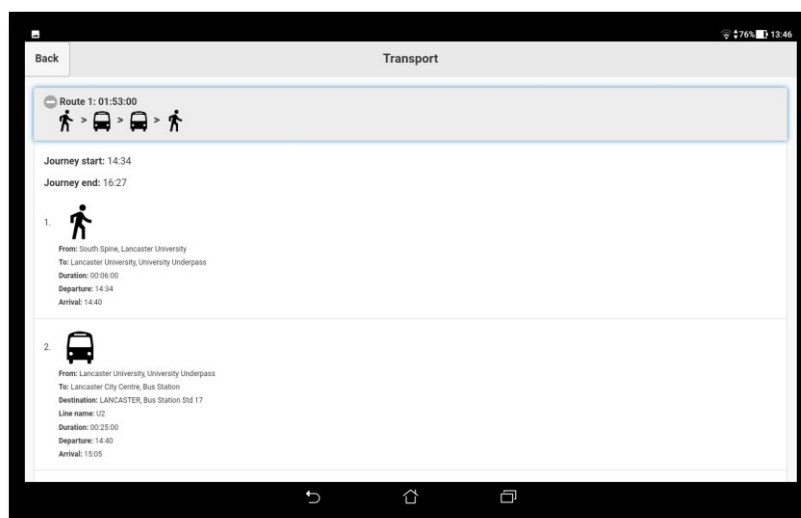


Figure 101: results page from a transport options search

Services app and Volunteering app

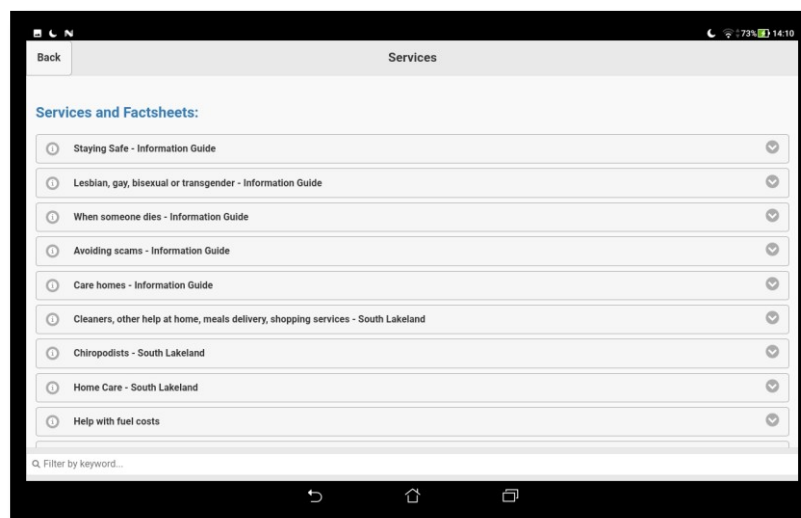


Figure 102: screenshot services available

These two apps provide information on local services and volunteering opportunities, respectively. This data is also sourced from the local authority and age charity. These are presented to the user with information about the service or opportunity, and also provide contact information if the user is interested. The list of available services/opportunities can be filtered using a keyword search, displayed in the app's footer.

Contribute Poster

This app enables end-users to become data contributors for the application. It asks end-users to take pictures of posters or newsletters, which are then uploaded to our servers. These images are uploaded along with geographic location coordinates. This data source has future potential for building up local knowledge, or even processing the image data to obtain additional event data, for example.

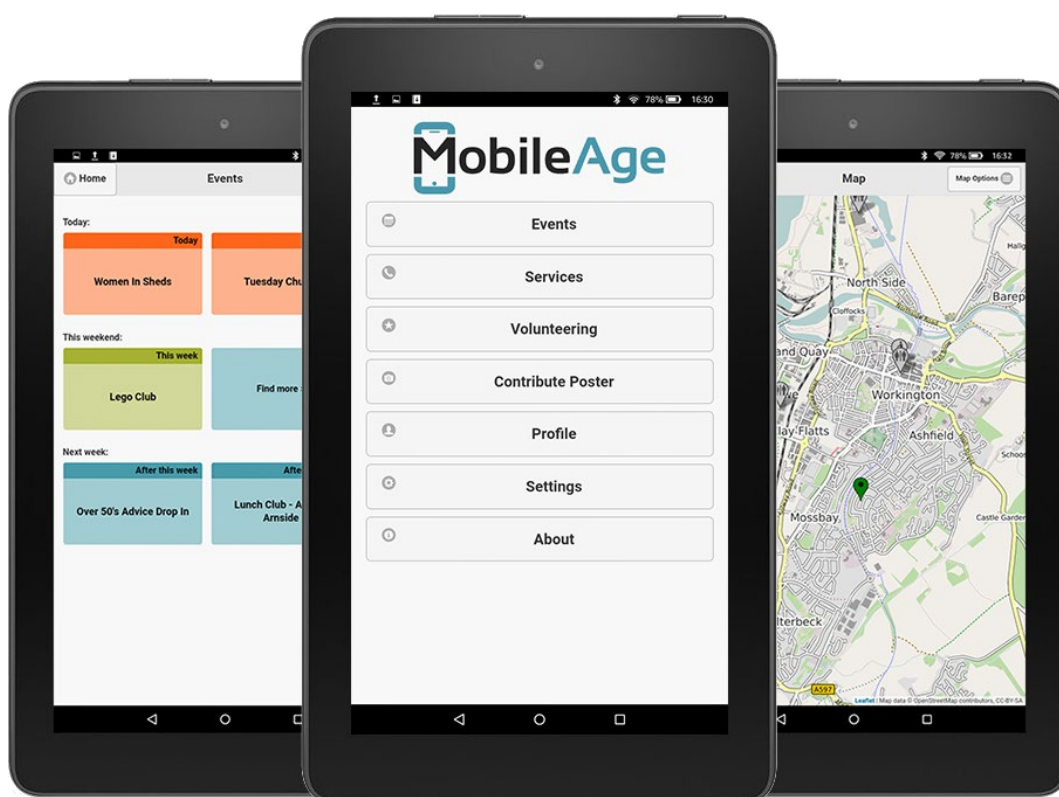


Figure 103: Some examples of pictures uploaded by participants using the Contribute a poster app captures during testing stages of the Mobile Age Social Connectedness apps development



Mobile Age Demonstrator Applications at South Lakeland

Welcome to the Mobile Age Demonstrator Applications for older adults at South Lakeland. With the application you will be able to find nearby events, services and volunteering opportunities in your local area. You will be also able to share events in your local area with the community using the Mobile Age application. The Mobile Age app is transparent regarding the collection and use of your data.



S

Launch demonstrator:

To install the application, please visit:

<https://scc-Mobile Age.lancs.ac.uk/app>



11.5 Thessaloniki

11.5.1 Output

The key features of our application are briefly described below as a form of offered services:

1. Hospitals service: Using the application, older adults are able to search for on-duty hospitals in their city of residence. More specifically, she can select multiple clinics and search for nearby on-duty hospitals at any selected date. Additionally, the results can be shown on a map, and if the user wishes to do so, they can see the route to a desired hospital or communicate with it.
2. Doctors service: The app allows older adults to locate doctors of various specialties. More specifically, the user is able to look for one or more specialties, search for doctors and communicate with them. The results are shown on a map and the user can see the route to a desired doctor.
3. Pharmacies service: Using the app a user is able to search for on-duty pharmacies, either by specifying a desired area/neighbourhood, or by using her current location. Again, the results, will be shown on a map where a user can either obtain the route to a specific pharmacy or communicate with it.
4. Prescription service: In our application, a senior user is able to fill a prescription from an affiliated pharmacist, by scanning the corresponding barcode. Then, the pharmacist can confirm the drug availability, and notify the user that they can pick them up by visiting the pharmacy. The procedure will be better understood in section **Fehler! Verweisquelle konnte nicht gefunden werden..**
5. Panic button service: In our application a senior user is able to tap a “panic button” in order to make an emergency call, either to a default city service (police, ambulance, fire department) or to a pre-defined desired call number.
6. Personalisation settings: In our application a senior user is able to personalize the application, by setting some preferences for the aforementioned services. Particularly, preferences can be adjusted for the pharmacy, panic button and prescription services and all will be analysed further in section **Fehler! Verweisquelle konnte nicht gefunden werden..**



Figure 104 Views of the Thessaloniki app from a mobile phone.



Figure 105 Views of the Thessaloniki app from a tablet.

The demonstrator prototype application can be visited or installed in the two following ways:

1. Accessed as a normal website from the following link:

<https://apps.mobile-age.eu:6050/index-senior>







2. Installed in an android device by installing the .apk file from the folloing link:


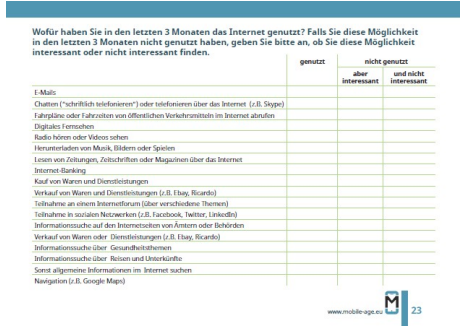
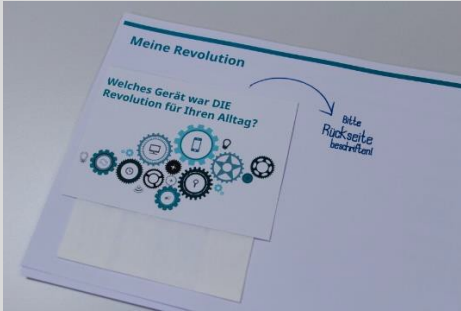
<https://apps.mobile-age.eu:6050/apk/senior>

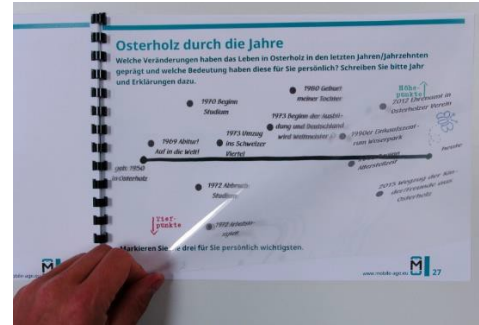
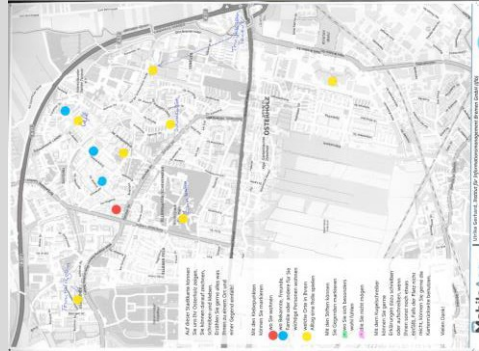
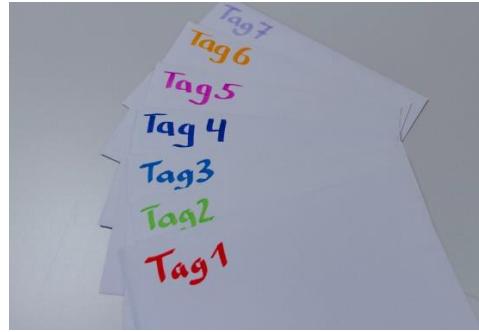




Appendix D: Cultural Probes as developed in phase 1

	<i>Rationale</i>		<i>Cultural probe</i>		<i>Question</i>
1	Convey a positive image about participants as being active (display with digital devices, cameras) and connecting with Osterholz (map)		Cover		n/a
2	Personal information		General information about participants (once) <ul style="list-style-type: none"> • Gender • Year of birth • (former) occupation • Living circumstances (alone, in partnership, with family, other) 		

3	Develop an understanding of the everyday activities of the participants	diary allows participants to record everyday activities	Diary (daily): Please record what you have done today (morning, lunch, afternoon, evening)		
4	Document the communicative practices of the participants and their media repertoires Develop an understanding of what kind of relationships are mediated through technology.	media diary allows participants to reflect on use patterns and gives researcher a first glimpse	Media diary (daily): With whom did you have contact today and how?		What are your communication patterns and what role do digital devices play?

5	Document media repertoires		<p>Media repertoire questionnaire (once)</p> <p>Participants were asked to assess how often they use specific media (TV, radio, phone etc.).</p>		Which media do you use on a daily basis for what purpose?
6	<p>Develop an understanding of the use patterns of Internet technologies</p> <p>Develop an understanding of a participant's relationship to technology</p>		<p>Internet service use questionnaire (once)</p> <p>Participants were asked to provide information about for what purposes they have used the Internet in the past 3 months (e.g. emails, chats, online-banking, routing, online-shopping)</p>		Which types of services did you use the Internet for in the last 3 months?
7	Learning about biographical relevance of technology		<p>Postcard 1</p> <p>Participants were asked to reply on the back of the postcard to the question: <i>“What was the technical invention that revolutionised your everyday?”</i></p>		

8	Understand relationship to space-related dimension of inclusion (e.g. bonds to living environment)	time line allows to capture time dimension	<p>Timeline Osterholz (once)</p> <p>Which events have changed life in Osterholz over the past years/decades und what implications did this have to you personally? Please add year and explanation. Mark the three most important ones.</p>		What is your personal relation to Osterholz, your district and your neighbourhood?
9	Understand social inclusion with respect to primary networks and space .	map allows to capture spatial dimension	<p>Map (once)</p> <p>Participants were asked to highlight where they live (red dot), where friends & family live (blue dots), where important places for their everyday are (yellow dots). On the right is the map of participant #1.</p>		How connected do you feel to people/places and what is the spatial dimension <neighbourhood, quarter, district, clubs>? Which social networks are you part of and where do you meet?
10	Understand the reach of people's activities , and understand their relation to space .	map allows to capture spatial dimension	<p>Mobility maps (daily)</p> <p>The participants received 7 printed district maps and were asked to draw their movements each day, if possible with explanations about modes of transport etc.)</p>		Which places do you go regularly to? What are your mobility patterns?

11	<p>Understand participants emotional bond to the district (places, people, animals, etc.)</p> <p>Develop a common understanding (between co-creators) of what may need to be seen in a service that aims to improve social inclusion.</p>	<p>photographs allow to see Osterholz with the participants' eyes</p>	<p>Disposable camera</p> <p>What do you do/where do you usually go/With whom do you speak if...?</p> <ul style="list-style-type: none"> You feel lonely You are upset You need help You want to relax You want to get diversion <p>Please take pictures of places, people, objects and/or animals.</p>		<p>What are the places/people that are important to you? How do they look like?</p>
12	<p>Learning about how people perceive of the future of the district (positive/negative)</p>	<p>imagining the future may invoke associations about visions & ideas for service</p>	<p>Postcard 2</p> <p>Participants were asked to reply on the back of the postcard to the question: <i>"How will Osterholz look in the future?"</i></p>		<p>What could be better/improve in the district?</p>

13	Learning about what makes Osterholz unique	sketching allows for participants creativity	Postcard 3¹⁰ Participants were asked to draw a doodle and imagine an <i>emblem of Osterholz</i>		What do people perceive as unique about the district?
14			Postcard 4 Participants were asked to reply on the back of the postcard to the question: <i>"In the old days everything was better?!"</i>		

¹⁰ The picture on the right hand side is a completed probe from one of our participants.

Appendix E: Personas in phase 1

Persona 1: Uwe Meier



71, retired, widower,
lives alone in house with garden

Herr Meier has a good pension

Mobility: good (on foot, with bike), owns a car but also
uses public transport frequently

Herr Meier has regular and close contact to his children (and grandchildren), who do not live in Osterholz. Close contact with friends who live outside Osterholz is very important to Herr Meier and he visits them regularly. Some of his acquaintances live in Osterholz.

He runs his daily errands (e.g. grocery shopping) usually outside the district (city centre, e.g. organic food stores).

Herr Meier has many hobbies (e.g. attending concerts, exhibitions, theatre, and sports) which often take place outside of Osterholz. His relationship to the district is not very close as he spends most of his time outside and follows his interests and needs elsewhere. The district is mainly his house and garden. He knows the area around his house very well.

Herr Meier is a competent PC and smart phone user. He uses digital media regularly, but does not always take his mobile phone with him.

Future scenario & questions:

As Herr Meier grows older and becomes less mobile, he cannot travel to the city centre as often (on his own). He needs support in running his household.

- How can Herr Meier be supported with respect to his inclusion/integration into the district?
- Which aspects of inclusion are important?
- What needs to change in his living environment?
- How could the Mobile-Age app support her?

Persona 2: Gertrud Fischer



63, employed,
Regularly looks after her grandchildren

Married, lives in house with garden

Frau Fischer has a sufficient salary, but expects only a small pension

Mobility: Limited (uses her bike, but not as much), no car and hence dependent on public transport

Her partner and her neighbours are very important to Frau Fischer, her family also lives in the district. She knows many people in her neighbourhood, contacts to people outside Osterholz are less important and less frequent.

Frau Fischer and her partner run their daily errands (e.g. grocery shopping) primarily in the districts (e.g. farmers market, super markets, bakery). Frau Fischer volunteers in a charity for refugees and socially disadvantaged families). Once a week Frau Fischer and her partner go bowling with a group of friends.

Frau Fischer is deeply rooted in Osterholz and holds a strong bond to the district and its residents. She likes Osterholz very much and knows the district very well. Frau Fischer knows many formal and informal stakeholders and hence know where to turn with her requests. She also knows the cultural offers very well and knows where to find information about them.

Frau Fischer rarely uses digital media. Her husband owns a smart phone, but she is rather sceptical towards technology. In her opinion risks associated with technology outweigh possibilities.

Frau Fischer has some minor health issues, but is overall fit.

Future scenario:

Frau Fischer retires. She will have a tighter budget, but at the same time will also have more time.

- What might change in Frau Fischer's life?
- Which different needs or resources might Frau Fischer have?
- How could the Mobile-Age app support her?

Persona 3: Ursula Greve



80, retired,
She cares for her critically ill husband. They live in a small flat.

Frau Greve was a housewife for most of her life. The pension of her husband covers their expenses.

Mobility: Limited (she can't walk long stretches or use the bike), family Greve owns a car which they use on a daily basis.

Her partner and her family (who also lives in the district) are very important to Frau Greve.

Frau Greve runs her daily errands (e.g. grocery shopping) primarily in Osterholz (Weserpark or super market close by).

Because of lack of time, Frau Greve does not do any charity work or has time for hobbies. Once a week Frau Greve attends an aqua sports group.

Her relation to the district is primarily related to her immediate neighbourhood, in which she spends most of her time. She knows the neighbourhood very well and also knows about social and cultural activities. Frau Greve only knows very little about other neighbourhoods of Osterholz. She like living in her neighbourhood.

Frau Greve uses different digital media. She communicates daily with her children via WhatsApp (smartphone) and looks for information on the Internet (e.g. news). She is not concerned about data protection.

Future scenario:

Frau Greve's husband dies. After a long time, she has more time to herself. Because of her small pension she is required to move out of her flat.

- What might change in Frau Fischer's life?
- Which different needs or resources might Frau Fischer have?
- How could the Mobile-Age app support her?

