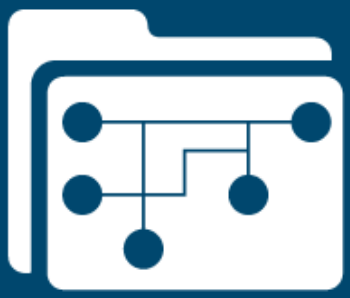

TROPICO

Transforming into Open, Innovative and Collaborative Governments

PRACTICES OF EXTERNAL COLLABORATION FOR SERVICE DELIVERY

Comparative case studies on external collaboration in eHealth partnerships

Work Package 7 – Deliverable 7.1

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EXECUTIVE SUMMARY

In recent years, governments have been searching for new ways to create innovative services. Complex, wicked problems such as the current pandemic require governments to create new services, because the pre-existing services are inadequate for solving such problems. Collaborating with private stakeholders presents an interesting avenue to stimulate innovation in public services as it connects knowledge from varied fields and promotes learning processes that might facilitate innovation. Particularly in highly complex and digitalised sectors such as the eHealth sector, governments search for collaborative partnerships with external actors—both from the for-profit and non-profit sector—to engage in innovation processes. The current research report investigates the conditions that affect collaborative partnerships in creating innovative public services and specifically focuses on eHealth. We direct our search towards six clusters of conditions: 1) the partnership structure, resources, and governance; 2) the management of collaborative innovation, 3) the dynamics and activities of the collaborative innovation process, 4) the external context for the partnership and the external support for innovation, 5) user involvement in the innovation process, and 6) the role of ICT in fostering collaboration and innovation. The report examines nineteen case studies of collaborative eHealth projects in five countries (Belgium, Denmark, Estonia, Spain and the Netherlands). Two broad types of eHealth projects can be distinguished in this report: eHealth projects that aim to create tools to facilitate administrative simplification and the digitalisation of data sharing, and eHealth projects that aim to create telehealth tools, mobile health applications, and smart devices. The results of the report are based on a cross-case analysis of 131 interviews with project coordinators, public and private collaboration partners, and users (e.g. citizens, health care professionals, patients, etc.). The results indicate that collaborative innovation is stimulated by both structural features (e.g. partnership structure and governance, resources, contracts, ICT, etc.) and relational interactions (e.g. network management, learning, user involvement, external support for the innovation, etc.) and that balancing these two sets of conditions is essential to foster the desired innovation. Furthermore, a second balancing act is necessary for both sustaining the

collaborative partnership and generating innovation. As collaborative partnerships are complex environments in which a multitude of actors engage with each other, governance strategies and instruments (e.g. goal definition and alignment, contractual agreements, etc.) are necessary to ensure that the partnership achieves its objectives. However, innovation thrives in complex environments where a lot of exploration and creative discovery is possible. Controlling the process too rigidly inhibits these creative processes, while being too laissez-faire makes the collaboration unstable and potentially hinders any progress towards an acceptable outcome. Balancing these opposing dynamics is crucial when creating new eHealth services through a collaborative partnership.

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Introduction

1.1. Aim of the report

The main objective of the TROPICO project is to study how public administrations are transformed into open, innovative and collaborative governments. Furthermore, the project draws special attention to the role of ICT. The present research is part of Work Package 7 (WP7) "Practices of External Collaboration for Service Delivery". WP7 aims at examining how innovative public services are developed by collaborations between public and private actors, and users (i.e. collaborative innovation). Innovative public services are defined in this report as public services which are "perceived as new by an individual or other unit of adoption" (Rogers 2003, 12). Innovation is seen as an "intentional and proactive process that involves the generation and practical adoption and spread of new and creative ideas, which aim to produce a qualitative change in a specific context" (Sørensen and Torfing 2011, 849).

Two project objectives are related to this work package: *1) the analysis of different types of partnerships between governments, stakeholders, and users in delivering innovative services (including public–private partnerships, societal partnerships, and network-like innovation partnerships)*, and *2) the analysis of the attitudes, skills, knowledge, and incentives for individual actors involved in transforming collaboration in external service delivery, particularly focussing on stakeholders and users.*

The research is oriented towards *public service partnerships* in which non-profit organisations and private businesses collaborate with government to create innovative public services. These partnerships come in different types: (a) public partners and private firms collaborate in contractual arrangements; (b) societal partnerships in which private (non-profit or for-profit) organisations lead the partnership; and (c) network-like innovation partnerships, which are led by governmental actors.

Hence, WP7 examines *whether and under which conditions these different types of partnerships result in innovative service delivery* and to what extent this is caused by

(a) partnership features (management, leadership and trust),
(b) the drivers and level of participation of individual stakeholders and users, and
(c) the application of ICT tools to foster collaboration and user involvement.

We do this by conducting comparative case studies with private stakeholders and individual users. Nineteen case studies were conducted in five countries: *Belgium, Denmark, Estonia, Spain and the Netherlands*. The answers of a total of 131 respondents were used in this study[1]. Data were collected in interviews, surveys and Q-sorts. The results were analysed comparatively by using fuzzy set qualitative comparative analysis (fsQCA), Q-methodology and qualitative analyses. A complementary analysis of other conditions covered by our conceptual model (see figure 5), can be found in a separate research report (TROPICO Deliverable 7.2)[2].

As we will thoroughly discuss below (see section 1.2 Case selection), we position our research towards **collaborative innovation in eHealth**, which has significant practical relevance. The study further focuses on the use of Information Communication Technology (ICT) to foster innovation in service delivery. ICT is crucial in the creation of innovative health services for three distinct reasons. First, ICT is a component of eHealth services and facilitates the creation of new services (e.g., a new app to detect particular illnesses). It also makes current health services more efficient because ICT eases the dissemination of information (e.g., eHealth data-sharing platforms).

Second, ICT also stimulates collaborative innovation between disparate partners. Digital communication technologies make it easier to bring disparate actors together and sustain qualitative relations between these actors. It also makes certain innovation phases less challenging. For instance, we will see in our case studies that ICT was in most cases essential

[1] In the original WP set-up fifteen cases were envisaged, being three case studies in each country, but the WP team managed to do four extra case studies, allowing more refined analyses (e.g. the inclusion of more conditions in the analyses).

[2] See D7.2 of work package 7 of TROPICO: https://tropico-project.eu/publications/

to setting up a testing environment in which users could work with the new eHealth technologies. The use of ICT to set up these testing environments was unrelated to the technologies utilised in the innovation itself. However, it was a crucial enabler for the collaborative innovation process as it stimulated testing and learning and facilitated intensive user involvement.

Third, ICT in the wider environment also stimulates collaborative innovation in eHealth, as it facilitates information sharing. National eHealth systems are a good example of this. The national eHealth system creates a digital network of health actors. Digitalised information is exchanged through this network. Thus, it becomes easier for actors in the network to establish partnerships that aim to create new eHealth solutions (as they are already part of the digital network). Furthermore, the national eHealth infrastructure also enables health actors who are not part of the network to collaborate with network members, as the network makes it easier to implement and diffuse new eHealth solutions. Thus, eHealth infrastructure is both a driver (as it stimulates new health actors to collaborate with network members) and an enabler (as it enables collaborative innovation between network members) of collaborative innovation. However, national eHealth infrastructure is only one example of the driving and enabling effect that ICT has on collaborative innovation. eHealth innovations that have been generated through collaborative partnerships may by themselves also be drivers or enablers of new collaborations between disparate actors. Several eHealth innovations have been created by enabling the sharing of digitalised information between health actors. This facilitates collaboration between these health actors in the future. Therefore, one partnership that creates an eHealth innovation can spur other partnerships to blossom, which in turn creates a chain of projects that are aimed at innovative service delivery.

This case study report provides a comparative description of a set of conditions related to collaborative innovation in partnerships between public actors, private actors and users. The following, second report based on the research (TROPICO Deliverable 7.2)[3] is aimed at a

[3] See D7.2 of work package 7 of TROPICO: https://tropico-project.eu/publications/

deeper analysis of these (and other) conditions using qualitative comparative analysis (QCA) and Q-methodology. Some of the conditions mentioned in the case studies of chapter 3 will be analysed in more detail in that report, as the used methodologies in the report provide better means to compare some of the conditions.

We next describe the case selection, conceptual framework and data collection, after which we will introduce the lessons learned from the cases. The last part of the report provides a detailed description of all of the case studies.

1.2. Case selection

Two criteria were used to define the types of partnerships in this study. The first criterion was related to the structure of the partnership, whereas the second criterion was related to the type of policy sector in which these partnerships were active.

1.2.1. Structural partnership features

Initially, three types of partnerships were selected for the case studies: 1) Contractual partnerships, 2) Governmentally coordinated partnerships, and 3) Societally coordinated partnerships. These partnerships are defined as follows:

1. **Contractual partnership**: "cooperation of some sort of durability between public and private actors in which they jointly develop products and services and share risks, costs, and resources which are connected with these products" (Van Ham and Koppenjan, 2001, p. 598). Public actors stand for governments, government organisations like departments or quasi-autonomous agencies, departments, etc. Private actors specifically stand for for-profit actors such as companies, but third-sector organisations such as hospitals, universities, or health care organisations might also be involved in a contractual relationship with a public actor. A contractual partnership might involve relationships with external stakeholders such as citizens, but the public and private actors are central in this type of partnership. The key feature of

a contractual partnership is its contractual arrangement between the public and private actors, which is legally enforceable and thus generates legal ties between the partners (especially in relation to the output that the contract partners want to achieve). Taking away the contract signifies the dissolution of the partnership. Figure 1 illustrates this type of partnership.

2. **Governmentally coordinated partnership**: loosely coupled partnerships between public and private actors that are initiated and organised by governmental actors (government agencies, departments, local governments) and aim to develop or adopt services through collaboration between diverse (public and private) stakeholders (see figure 2).
3. **Societally coordinated partnership**: self-organised, loosely coupled partnerships that are initiated and organised by groups of private actors (citizens, non-profits, firms, etc.) with the purpose of creating/implementing services through collaboration between diverse (private and possibly public) stakeholders (see figure 3).

Figure 1: Contractual partnership: Partnership between public sector organisation and private sector actors in which external stakeholders can play a small, fixed role

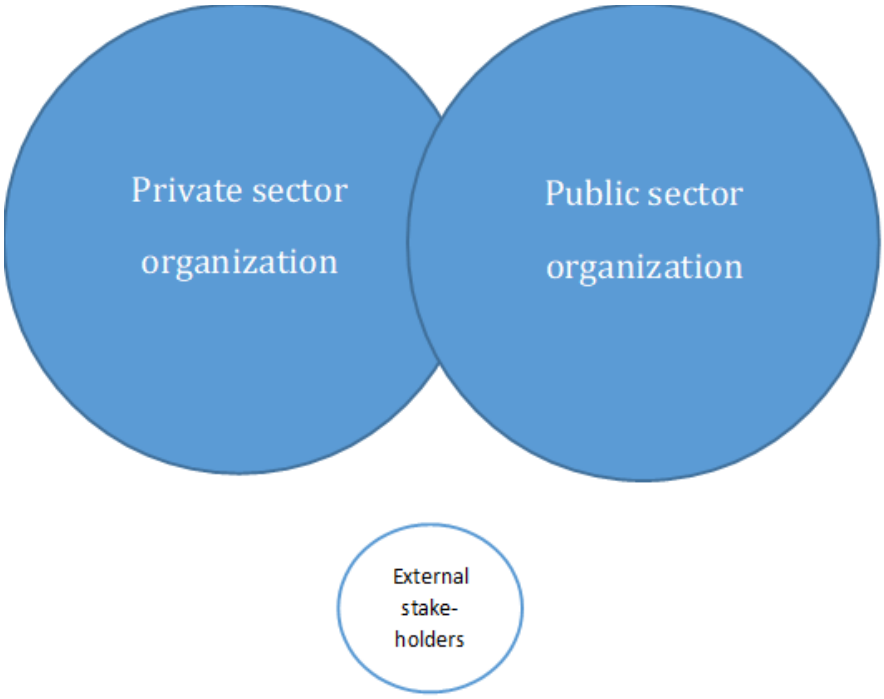


Figure 2: Governmentally coordinated partnership: Partnership between public sector organisation and a diverse set of other stakeholders, coordinated by a public sector organisation

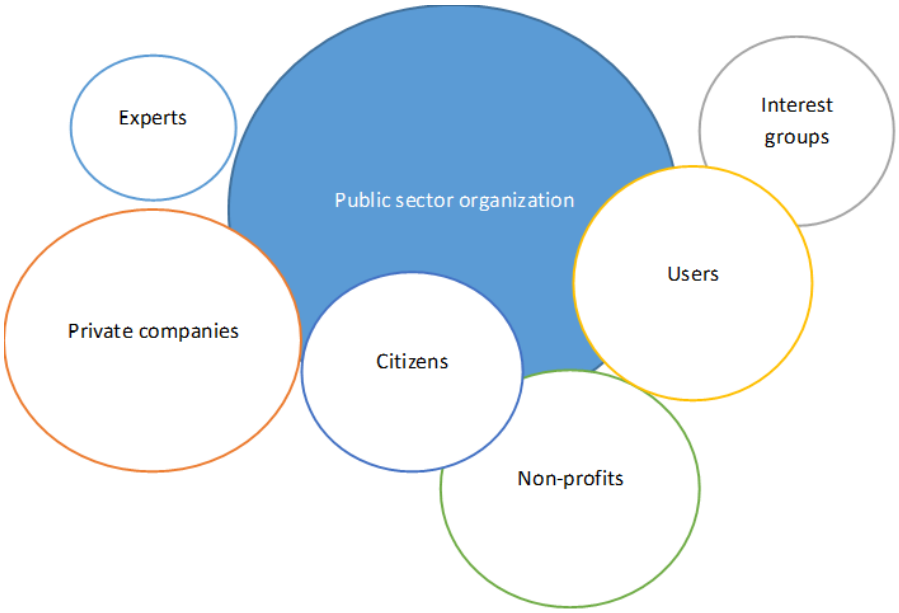
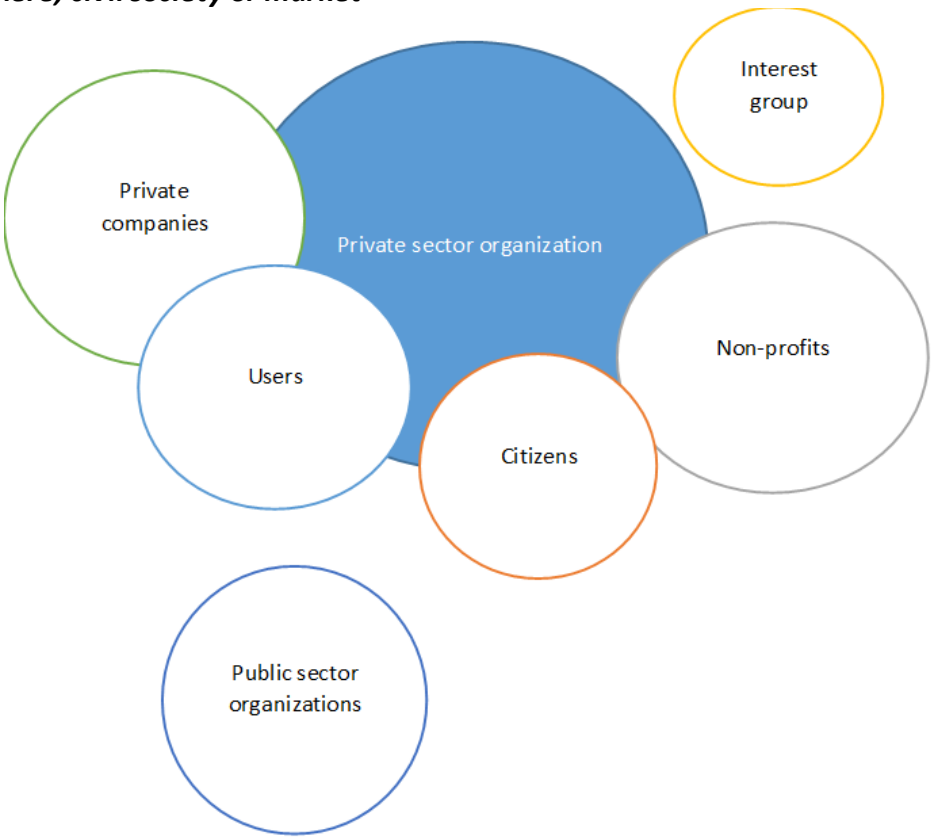
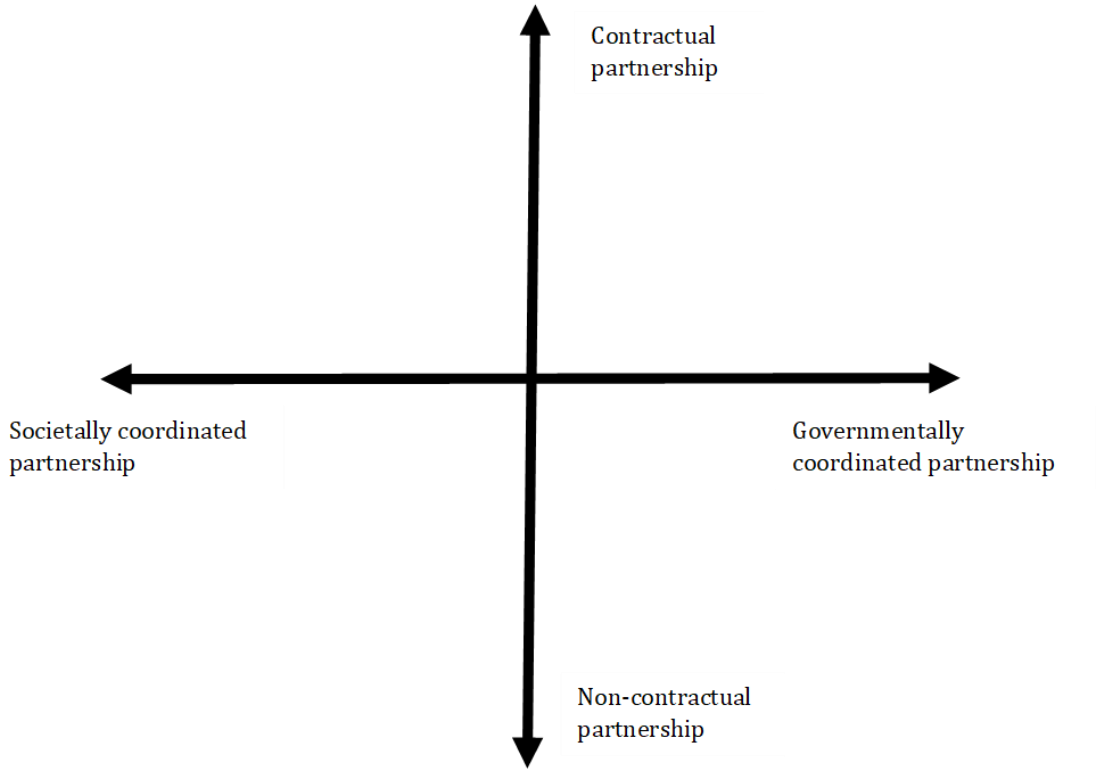


Figure 3: Societally coordinated partnership: Partnership between private sector organisations and a diverse set of other stakeholders, coordinated by private actors in the private sphere, civil society or market



During the selection of the partnerships to include in this study, it became apparent that the three types of partnerships mentioned above were extremes on a continuum, which meant that several partnerships position themselves between these extremes. Furthermore, the attempt to select cases also clarified that the first type of partnership, the contractual partnership, in which a formal, legally enforceable contractual agreement is the basis, was actually a separate dimension, that could be equally present in governmentally or societally coordinated partnerships. As such, the three types were put on two axes, which provided a more nuanced picture of the partnership types. Figure 4 illustrates these axes.

Figure 4: Types of partnerships



1.2.2. Policy sector: eHealth

The eHealth policy sector is rapidly evolving and is central to the European Commission's endeavours and prioritization. The Commission argues the following in a recent communication report to the European Parliament:

"*Health and care authorities across Europe face common challenges, which can be best addressed jointly. To this end, the Commission has been working with the Member States, regional authorities and other stakeholders to tap into the potential of innovative solutions, such as digital technologies and data analytics, and in doing so assist Member States in pursuing the reforms of their health and care systems. The Commission provides its support through funding and actions that promote policy cooperation and exchange of good practice (European Commission, 2018)*."

Furthermore, the Commission prioritizes several key issues with regard to eHealth to pursue in the coming years:

"*To date, the uptake of digital solutions for health and care remains slow and varies greatly across Member States and regions. Further action at EU level is crucial to accelerate the meaningful use of digital solutions in public health and healthcare in Europe. In its mid-term review on the implementation of the digital single market strategy the Commission set out its intention to take further action in three areas: 1) citizens' secure access to and sharing of health data across borders; 2) better data to advance research, disease prevention and personalised health and care; 3) digital tools for citizen empowerment and person-centred care*" (ibid.).

It is in the first and the third area that our research findings would make a contribution, since the interoperability of health data and the generation of innovative solutions for health services are issues that are tackled in collaborative partnerships. These eHealth partnerships are quite diverse but are largely captured by the conceptualisation of our three types of partnerships.

Since we focus on eHealth technologies as innovative outcomes, we searched for the components of these eHealth technologies. As eHealth research is rapidly changing due to the various new developments in technology (see Bekkers (2013) for an account of those developments), only recent reviews of such technologies can help us decide which components are present in current eHealth systems. A straightforward way to classify the various types of eHealth projects is to focus on the object of inquiry in these projects. Projects can be concerned with *1) Work processes*, *2) Information*, and *3) Services*. Each of these focal points has consequences for the type of innovation, the motives for collaboration and the role technology plays in the project. Using these broad focal points, we distinguish three broad types of eHealth projects, which are visualised in table 1.[4]

Table 1: Three types of eHealth projects

	Object of inquiry	Innovation type	Motives to collaborate	Role of technology
Administrative simplification	Processes	Process innovation	Health processes are cross-organisational	Technology stimulates organisational efficiency
Digitalisation of data sharing	Information		Health information is cross-organisational	Technology stimulates collaboration between organisations
Telehealth and mobile health tools and smart devices	Services	Product innovation	Required resources (budget, know-how, skills, etc.) are located in different organisations	Technology stimulates the development of new health services

- **Administrative simplification:** These eHealth projects are projects aimed at the standardisation, harmonisation, and integration of health systems and processes. The purpose of these projects lies in the development of simplified procedures to decrease the number of steps a user has to take, which consequently reduces the extent of administrative burden required to achieve desired outcomes.

[4] This classification was inspired by empirical work by Steunpunt Werk, a research consortium from the Flemish regional government which published a similar typology in OVER.WERK (2017).

- **Digitalisation of data sharing:** These eHealth projects aim to make information more accessible and useful to diverse stakeholders. Since information is stored in several organisations, digitalising the sharing of information removes the information barriers between them and facilitates the integration and centralisation of information. Consequently, the storage and usability of information for stakeholders is simplified.
- **Telehealth and mobile health tools and smart devices**: These are a cluster of eHealth projects that aim to develop new digital tools to support existing health services for users, or generate new types of health services. In these projects, technology is not (only) used to simplify processes or integrate information. Here, technology is (mainly) deployed to (physically) interact with users (a front-office service process). Examples include motion sensors, mobile apps, cameras, robots, and security systems.

1.2.3. Additional case selection criteria

Two additional case selection criteria were used, both of which are related to the collaborative innovation process. First, only cases that displayed some *level of user involvement* were selected. The goal was to study partnerships between public actors, private actors, and users. Variation in the intensity of user involvement was permitted. Some partnerships involved users by only informing them about the objectives of the project, while other partnerships involved active collaboration in which these users became part of the innovation process. A second additional selection criterion was *the degree of implementation*. We searched for projects that had already implemented the eHealth solution or were at least already in the testing phase. This made the evaluation of the respondents about the innovativeness of the created eHealth solutions more valid as they had already experienced the impact of the solutions practically or in a testing environment.

1.2.4. Selected cases

A total of nineteen eHealth cases were selected. Five cases were selected in Belgium, four in the Netherlands and Spain, and three in Denmark and Estonia. Table 2 gives an overview of all the cases and their project goals. All the cases had in common that the partnerships were collaborations between public and private stakeholders. Additionally, users were involved in

one or more stages of their innovation processes and the partnerships involved explicit innovation processes that aimed to create new eHealth technologies. Further details about the individual cases are provided in Section 3 of this report.

Table 2: Selected cases

Name of project	Short description	Type of eHealth innovation
Belgium		
MjinGezondheid	Portal website which provides patient information for citizens on a national level.	Administrative simplification and digitalisation of data sharing
MijnWGK	Tool which provides access for GPs to home care organisations' patient information.	Administrative simplification and digitalisation of data sharing
Evidence-based practice (EBP)	A new way of creating, validating and disseminating official evidence-based guidelines for health care providers.	Administrative simplification and digitalisation of data sharing
Nursing home Booghuys	New nursing home which implemented several technologies (wearables, smart cameras, etc.) to support residents and nurses in their daily activities.	Telehealth and mobile health tools and smart devices
Burenondersteuning	A platform which brings people with health/social care demands together with volunteers who provide help.	Telehealth and mobile health tools and smart devices
The Netherlands		
PGO in de Regio	ICT platform which facilitates the exchange of health information between partners and patients.	Administrative simplification and digitalisation of data sharing
OZO verbindzorg	Digital platform designed to foster neighbourhood collaborations between clients and consultants.	Telehealth and mobile health tools and smart devices
Smart Dementia project	Tracking technology which allows an open floor and the possibility for dementia patients to walk around freely.	Telehealth and mobile health tools and smart devices
Smart Diaper	Smart Diaper which automatically detects defecation and signals this to the nurses.	Telehealth and mobile health tools and smart devices
Spain		
SAMPA	An electronic prescription system, a patient appointment system for the Outpatient Dispensing Unit, a robot for automatic storage and dispensing in assisted and unassisted mode.	Administrative simplification and digitalisation of data sharing
Polycare	Advanced ICT systems designed to enable an integrated patient-centred care model to deliver home health care for chronic patients.	Telehealth and mobile health tools and smart devices

Name of project	Short description	Type of eHealth innovation
Mastermind	Computerised cognitive behaviour therapy (CCBT) through a web application which allows for self-administered treatment regardless of time or place.	Telehealth and mobile health tools and smart devices
Track AI	The application of Artificial Intelligence to diagnose uncooperative patients. It serves to determine whether they have any problems with their eyesight. In some cases, it also enables the diagnosis of the problem.	Telehealth and mobile health tools and smart devices
Estonia		
Centralised digital patient registration	A centralised registration system within the national patient portal where patients are able to book appointments with all health care providers that have partnered with the project.	Administrative simplification and digitalisation of data sharing
Proactive service provision for disabled people	A redesigned service process that combines three standalone services (application for disability; application for rehabilitation services; application for aids) into one logical service. It is achieved through changes in data processing and analytics.	Administrative simplification and digitalisation of data sharing
CoNurse	An app with a voice command function that supports the health care provider in carrying out procedures through digitalized guidelines.	Telehealth and mobile health tools and smart devices
Denmark		
Dysphagia E-learning	E-learning program that provides health professionals with knowledge about dysphagia.	Administrative simplification and digitalisation of data sharing
Patient Reported Outcome Measures in a mobile application (PROM)	An app for patient reported outcomes.	Administrative simplification and digitalisation of data sharing
Mobile health technology for women with osteoporosis	A smartphone app that helps convey the results of bone scans to patients with osteoporosis.	Telehealth and mobile health tools and smart devices

1.3. Conceptual framework

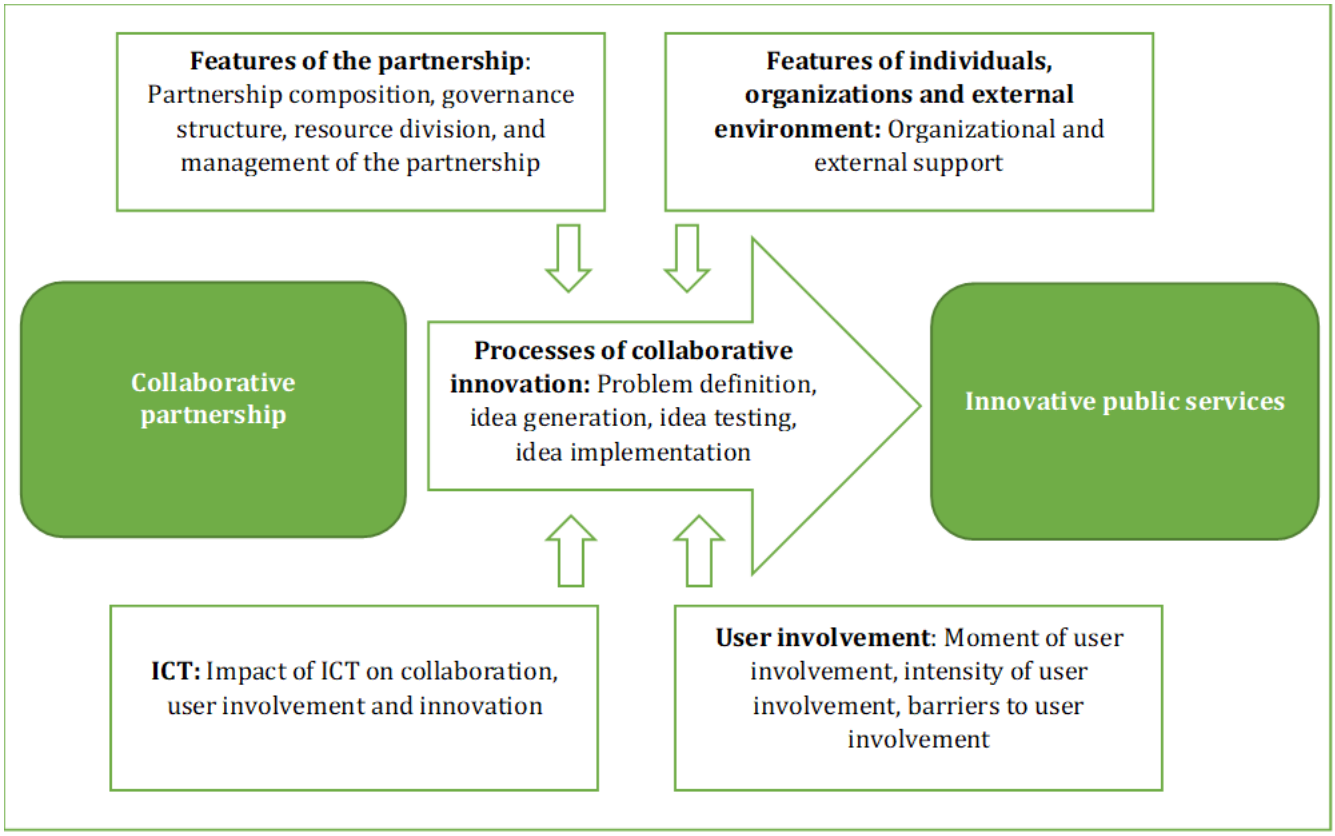
Policy makers engage public sector organisations to solve a variety of societal problems. Innovation can be a way to achieve the solutions to those problems (Dougherty and Hardy 1996). Traditional methods might be insufficient to solve complex, wicked problems and new, innovative services might be generated in the process of solving these problems (Sørensen and Torfing 2011). Different authors from diverse fields have made a strong case in support

of collaboration as a mechanism to produce this innovation. However, despite the recent surge in collaborative innovation research in the public sector (e.g. Hartley, Sørensen and Torfing 2013; Diamond and Vangen 2017; Torfing 2019; Windrum 2014; Wegrich 2018), there is still much is still unknown about the specific conditions and the dynamics that lead to collaborative innovation. This report addresses this knowledge gap by considering a broad set of conditions that might impact the innovativeness of new public services.

Figure 5 shows the conceptual approach used in our research. By selecting a broad set of different types of partnerships, we are able to assess the impact of different partnership structures and governance on the innovativeness of the public services they create. We considered four clusters of factors that might stimulate collaborative innovation. The first cluster is that of the *partnership features*. We considered the composition of the partnership (i.e. the partners in the partnership), the resources that the partners have access to or bring into the partnership and the governance of the partnership (i.e. whether there is one lead actor in the partnership or multiple lead actors). At his level, we also considered how the partnership was managed (contract management and network management).

The next cluster of conditions considers factors on the level of the individuals in the partnership and *the organisations that the individuals in the partnership represent*. In this case study report, we specifically focused on the external support for innovation from the organisations (but also from the elected politicians, media, and the broader eHealth sector). The third cluster consists of *the role of ICT* for the collaboration and the innovation. We looked at how ICT internal to the collaboration process stimulates collaborative innovation, but also how external ICT-architecture (e.g. national eHealth infrastructure) affects the collaborative innovation processes. The fourth cluster looks at *how users are involved* in the innovation projects. How intensive was their involvement and in which stages of the innovation process were they involved?

Figure 5: Conceptual framework



1.4. Data collection

Data was collected for the nineteen cases through interviews, surveys and Q-sorts (i.e. a sorting exercise which helps uncovering the perceptions of respondents about certain subjects). We followed a systematic, highly standardised data collection strategy that entailed a minimum of interviews, surveys and Q-sorts in order to obtain sufficient data to conduct a comparative case study (see table 3). A total of 131 interviews, 124 surveys and 112 Q-sorts were collected. The interview data was reported by using an interview template with all the interview questions, which the researchers had to fill in. Data was collected from project coordinators, public partners, private partners and users. The template for data collection is illustrated in table 3. Note that some cases had more respondents than those listed in table 3. Additionally, not all of the questions were asked to the same respondents.

Table 3: Data collection strategy

Per case	For the total of WP7
Minimum of 6 interviews • 1 interview with a coordinator • 1 interview with a public partner • 1 interview with a private partner • 3 interviews with users	Minimum of 114 interviews • 19 interviews with coordinators • 19 interviews with public partners • 19 interviews with private partners • 57 interviews with users
Minimum of 6 surveys • 1 survey with a coordinator • 1 survey with a public partner • 1 survey with a private partner • 3 surveys with users	Minimum of 114 surveys • 19 surveys with coordinators • 19 surveys with public partners • 19 surveys with private partners • 57 surveys with users
Minimum of 5 Q-sorts • 1 Q-sort with a public partner • 1 Q-sort with a private partner • 3 Q-sorts with users	Minimum of 95 Q-sorts • 19 Q-sorts with public partners • 19 Q-sorts with private partners • 57 Q-sorts with users

We use the clusters of conditions indicated in figure 5 as the structure for chapter 2 and chapter 3 of this report. Each cluster is a subsection of these chapters. Our focus is however different between the two chapters, which also meant that sometimes other conditions were highlighted in chapter 2 as opposed to chapter 3. Chapter 2 focuses on the comparative lessons learned from all of the observed cases, while chapter 3 gives a detailed description of the mentioned clusters of conditions for each case. The detailed descriptions in chapter 3 are a synthesis of the interviews the researchers collected in the different cases, while the cross-case analysis in chapter 2 was conducted with information from the case studies described in chapter 3, but also from the interview and survey data. This allowed us to take more information into account when formulating the lessons learned. The lessons learned are also a selection of the most important lessons from the cases. The other conditions are analysed in a separate research report (TROPICO Deliverable 7.2)[5]. The qualitative comparative analysis (QCA) and Q-methodological analysis used in that report allowed us to dive deeper into (combinations of) conditions.

[5] See D7.2 of work package 7 of TROPICO: https://tropico-project.eu/publications/

2. Lessons learned

The nineteen innovative eHealth projects that we studied took place in five different European countries in different national contexts. The projects varied in objectives, scope, and structure. Some of the projects involved data-sharing platforms that facilitated a smooth exchange of information between actors in the health sector. Others were innovative projects that developed and implemented new applications of digital technologies such as wearables, artificial intelligence, and big data. Moreover, a multitude of private, public stakeholders, citizens, and professionals were included in the partnerships in many different ways. Some partnerships were initiated by national, regional, or local governments to tackle a particular policy problem in the health sector. Other partnerships were more bottom-up and were initiated by health organisations such as hospitals or nursing homes. Some projects were initiated by private organisations, for example, to improve their reputation in the sector or to generate awareness regarding the applications they developed.

Notwithstanding this case diversity, a cross-case analysis of the success factors of the different innovation projects reveals interesting lessons that were important in multiple cases. These lessons indicate several different success factors of collaborative innovation. In all of their diversity, the collaborative partnerships gave us significant insight into the broad set of conditions that shape the collaborative environment. Further, without the ambition of being comprehensive, the lessons learned reveal how collaboration between different stakeholders can benefit digital innovation in the eHealth sector. Lastly, these lessons highlight some of the challenges that collaboration brings about. We structured them in the following manner:

- Partnership structure, resources, and governance
- Management of collaborative partnerships
- Dynamics and activities in the innovation process
- External context of the partnership and external support for innovation
- User involvement in innovation process
- Role of ICT in fostering collaboration and innovation

We will end the discussion of the lessons learned with some recommendations for practice.

2.1. Partnership structure, resources, and governance

Our analysis of lessons learned in the cases indicates that an important element of successful collaborative innovation relates to **the structure of the partnership**. This refers primarily to the selection of partners and how resources are connected within the partnership. Every partner brings along different resources and collaborates because of different motives. The collaborative environment is shaped by the roles that different partners adopt in the partnership and their relationships with each other. Actors in a collaborative partnership are more or less interdependent, which consequently influences the success of the partnership's activities.

2.1.1. Composition of partnership

The first set of success factors identified in our cross-case analysis relates to the composition of the partnership. A large divergence in motives, resources, and internal processes can create complexities and hamper mutual understanding and agreement. At the same time, one of the virtues of collaboration is learning, facilitating new interpretations and sense-making (Sørensen and Torfing 2011). In other words, diversity among collaborating partners is both a virtue and a barrier to collaborative processes. In collaborative innovation, the selection of the partners participating in the network needs to take into account the variation in the motives, resources, and internal procedures of different stakeholders, as these aspects have a significant influence on the ensuing process. Actively seeking a proper balance between the diverse actors in order to stimulate creative processes and generate synergy through their alignment is crucial for enhancing the collaborative innovation process.

For example, in the Danish *Dysphagia e-Learning* project, the private partner was a leader in e-learning at the time of the project and had a background in the public sector. The partner's experience with public actors allowed the private partner to speak the same language as the other partners, which enabled smooth communication with users and public representatives. Further, the company was familiar with the hospital procedures. Conversely, in another Danish project *Mobile health technology for women with osteoporosis* a mismatch of the selected actors led to the replacement of the private partner with a business that was more

local and less profit-oriented. This change in composition of participants in the collaboration was important for the eventual success of the project. In the case of the *Centralised Digital Patient Registry* in Estonia, previous reform attempts had failed because of a lack of a proper value proposition for health care providers. Thus, a user-representative was included as a core actor in the collaboration.

In the case of *Evidence-based practice (EBP)* in Belgium, the composition of the partnership touches upon the very essence of the challenges that the collaboration encounters. The objective of the project was to tackle the fragmentation of the landscape of evidence-based health professions. As a consequence, a multitude of health professions were included in the partnership in an attempt to cover the entire field of evidence-based health practise. This large number of stakeholders brought along many different opinions and interests during the subsequent collaborations. As the objective was to avoid fragmentation, every stakeholder's opinion and interest had to be considered, which resulted in an extremely complex collaboration and innovation process. By actively participating in the network, the government hoped that the network's activities will become slightly more coordinated.

Another element of the partnership's structure is the role every actor takes on within the partnership. Several cases stress the importance of the position and legitimacy of the coordinator. In the case of 'Mobile health technology for women with osteoporosis' in Denmark, the project was the PhD-project of the coordinator. The coordinator's personal interest in the success of the project therefore legitimised her position. Legitimacy can also come through impartiality. In the case of *MijnWGK* in Belgium, the coordinator already had a coordinating position in the field of the health sector in which the innovation project took place (i.e. the project leader of the 'federated' non-profit organization which connected the other non-profits). Therefore, all actors involved accepted his leadership. The *Estonian Proactive Service Provision for the disabled people* took place in a field in which the long-held and rather inert positions of the collaborators inhibited progress. The coordinator was new in this environment, which enabled her to bring forth a fresh perspective to foster an innovative climate. The coordinator—being an active proponent for change (which she realised through

active engagement of relevant stakeholders and by fostering an innovative climate for change by making use of the Innovation Programme provided by the Government Office)—received support from the Social Insurance Board, which already had a dominant role in the field of service provision for the disabled. In the case of *OZO Verbindzorg* in the Netherlands, the coordinator was lauded by the other partners for their ability to improvise and solve problems immediately throughout the project. Due to their experience, the coordinator had a strong vision and extensive knowledge of the policy problem at hand. This made it possible for them to improvise effectively.

2.1.2. Division of resources

Second, our analysis points to an element interrelated with the composition of the partnership: the division of resources within the network. The coupling of resources is one of the reasons to collaborate, but these resources can also shape interdependencies. Actors engage in collaboration to achieve outcomes that they cannot achieve unilaterally (Ansell and Gash 2008). However, collaboration brings about a loss of autonomy, as it is necessary that all actors can achieve value through collaboration. Moreover, in situations of power asymmetries that result from an uneven division of resources, this can be a source of tension (Ansell and Gash 2008). It is therefore an important element that needs to be considered and understood to foster a successful collaboration.

For instance, the Belgian case of *Evidence-based practice (EBP)* is a good example of both the advantages of collaboration with regard to access to new resources (i.e., financial resources from the federal government) and the tensions that emerge because of the mutual interdependencies of the actors on these resources (i.e., competitive behaviour between actors, which sometimes led to conflicts).

Further, interaction between actors can also generate resources for (future) collaborative projects. Intensive interaction can build social or relational capital among partners that can be crucial to the project's success (Kale, et al. 2000, 218). In the Spanish case of *Mastermind*, some of the collaborating partners had worked together before. This was important as it

ensured a smooth and collaborative process that was free of conflict. Often, the division of financial resources is the most important source of power asymmetries. In the case of the *proactive service provision of disabled people* in Estonia, a lack of financial resources forced the project team to discard some ideas that could have contributed to the project's objective. As the financial resources were asymmetrically divided among the partners, some partners were not able to contribute to the partnership to their fullest potential. Similarly, in the *Burenondersteuning* case in Belgium, the project was initially planned to be implemented in three municipalities. However, two of them did not have the staff required to actively participate, which resultantly shifted the focus of the project to one municipality.

2.1.3. Governance structure

In some of the cases we studied, the establishment of a clear governance structure was influential to the collaborative process. A governance structure can clarify the roles and interdependencies between partners. A formal structuring of the collaboration can also be used to foster *the* interaction between certain stakeholders. The Belgian *Evidence-based practice (EBP)* case provides an example of how interdependencies can be structured by a governance structure. The government hoped to better coordinate the activities of the network. Therefore, they formally created a steering committee that had the decision-making power in the network. Since all of the EBP (evidence-based practice) partners were dependent on the financial resources of the federal government, this steering committee had the authority to push through decisions, thereby stimulating efficient decision-making. However, the governance structure also generated tensions between the core partners and the steering committee. Aside from the core partners that established the steering committee, none of the other core partners were structurally involved in the steering committee. This led to a lack of trust in the decisions made by the steering committee. Therefore, a governance structure must be well planned. It can streamline decision-making and clear up interdependencies, but information flows between the different parts and levels of the governance structure are important as well. Otherwise, the governance structure can result in a lack of trust and the fragmentation of decisions.

In the case of *PGO in de Regio* in the Netherlands, a 'director's table' was added to the governance structure to discuss the progress of the project at the highest management level in the respective organisations. This enhanced the coordination and level of trust between the involved organisations. Further, the involvement of the most important directors allowed for swift and legitimate decision-making, supported by the participating organisations. Similarly, in the Estonian case of the *Centralized Digital Patient Registration*, a steering committee was established that oversaw the actions of the project team and placed it in a wider, more strategic context. Through this steering committee, some stakeholders of the wider health field, such as patient representatives and the Health Insurance Fund, could be involved in the innovation process.

In conclusion, a governance structure can facilitate the participation of relevant actors in decision-making. Second, it can clarify the responsibilities and roles of the partners. Third, it can create clear lines for decision-making and communication between different actors in the partnership. However, one of its pitfalls can be a lack of communication between different parts of the governance structure. This can result in informal and opaque parallel decision-making and a lack of trust. Additionally, a shortage of bottom-up communication will lead to limited responsiveness of the partnership to changes in the environment, concerns of partners, and other unforeseen circumstances.

2.2. Management of collaborative innovation

Collaboration with a multitude of actors is by definition characterised by complex interactions between these actors. These complex interactions must be managed to steer the outcomes of the network (Klijn, et al. 2010). In our cross-case analysis, the **effective management of interactions, interdependencies**, **and conflicts** came to the forefront as important success factors. Our analysis put forward the importance of network management for four main reasons. First, it is important to steer the actions of the actors towards the objectives of the project. Actors with different motives, resources, and strategic behaviour can cause the

partnership to evolve toward outcomes that do not align with the initial objectives. Therefore, it is important to coordinate the actions of the partners. Second, innovation requires creativity and the exploration of new possibilities. Third, actors collaborate to achieve goals they cannot achieve independently. The management and coordination of a partnership should therefore create value for all the partners; otherwise, partners might leave the collaboration or influence it negatively. Lastly, collaboration between actors from diverse backgrounds can create tensions between them. Network managers need to be aware of these tensions and need to try to resolve them accordingly.

2.2.1. Contract management

Several cases in our study used formal contracts to ensure that objectives and roles were clear and that they were aligned among the partners. In the case of the Spanish *SAMPA* project, a contract in which the objectives were formally stated was agreed upon at the beginning of the project. The contract provided clarity to the partners regarding their roles. The project was completed on time and experienced negligible conflict. The clarified interdependencies in the contract were an important factor for this success. A similar example was the *MijnWGK* case in Belgium. A contract was signed between multiple regional, but autonomous health care organisations (however all from the same signature, namely '*Wit-Gele Kruis*') and a federated, encompassing health care organisation (which was especially established recently to connect the regional health care organisations with each other and coordinate their activities). This created contractual ties between these organisations and ensured their overall commitment to and engagement in the partnership. It also ensured the actors' autonomy in the project as it stipulated that any regional health care organisation could decide to stop the collaboration and work on innovation autonomously. The contract also guaranteed a continuous stream of financial resources that the partners could use to facilitate innovation. The coordinator of MijnWGK emphasised the importance of the contract between healthcare organisations and described it as one of the main success factors of the collaboration.

In other cases, a contract was used as an agreement to incorporate additional knowledge from another private party. In the *Track AI* case in Spain, the partnership lacked knowledge

regarding artificial intelligence. Additional expertise was gathered by including another private company. A contract was drawn up, which clearly stipulated what was expected from this company. Similarly, in the case of *nursing home Booghuys* in Belgium, a tender procedure was set up to find a contractor for the construction of the new nursing home. The tender procedure clearly defined the expectations of the project to potential candidates. Nonetheless, additional contracts were drafted after the closure of the tender contract in order to specify the relations between particular partners. Some partners signed a contract with each other to ensure desired reciprocal accountability and to prevent future disputes. Furthermore, the tender contract established a clear accountability relationship among the contractors, meaning that one contractor was accountable for the actions of another contractor, and the latter was accountable for the actions of a third actor (by making use of subcontractors). Although contract management was clearly crucial in this project, the innovation process still remained quite explorative (e.g., proof of concept (POC) in which various stakeholders could test the technological innovations and advise the project partners about these innovations). This suggests that a clear definition of the objectives and responsibilities through the use of a contract, which also legally enforces what the procurer wants, does not exclude an open and explorative innovation process.

The analysis of our case studies indicates that a contract can be an effective way to clarify interdependencies. It can also elucidate the roles of actors and establish accountability mechanisms. Other than coordinating the partnership, a contract can also stimulate interactions. It can reduce the risk of participating in a partnership. Further, it can give actors autonomy and room to operate within the partnership. Contrary to common belief, a contract does not always impede the partnership's ability to explore new possibilities. A contract can also structurally embed episodes of experimental freedom within the innovation process (e.g., the abovementioned "proof of concept" in the case of the nursing home Booghuys). A contract also provides clarity about responsibilities and objectives without rigidifying the innovation process. However, a constant balance between contract rigidity (clear goals and incentives) and contractual freedom (space to experiment and change things after contract close) needs

to be pursued by the coordinators of the partnership. Additional process rules (see Section 2.2.2. Network management) might help to ensure this balance.

2.2.2. Network management

a. Four network management strategies

In a collaboration, interactions between partners should create value that individual partners cannot achieve autonomously to the same degree. The strategies used to foster and manage interactions between actors in a collaboration are called *network management* (Klijn, et al. 2010, 1065). Klijn et al. (2010) distinguish four strategies to manage networks: *connecting, exploring, arranging*, *and process agreements*. Connecting strategies focus on the activation of actors and resources. Such strategies aim at creating a situation where actors are interested in collaborating and investing resources. Exploring strategies focus on creating opportunities for actors by clarifying the interdependencies, goals, and perceptions of the actors. Arranging strategies focus on creating (temporary) structures to facilitate interaction, consultation, and deliberation. Project teams and communication lines are examples of this strategy. Lastly, process agreements can be installed to manage networks. They define (temporary) rules that structure the interactions within a collaboration (Klijn, et al. 2010, 1070). In our cross-case analysis, several network management strategies came up as important to manage differences and to facilitate interaction between the actors. The use of these strategies was mentioned as a key success factor for successful collaboration.

The *PROM* case in Denmark is an example where network management served as an important success factor. The coordinator was praised for lowering the threshold for participation, which is an example of a connecting strategy. By incentivising cooperation, the coordinator activates partners and initiates collaborative processes. This allowed for the development of an innovation in which the concerns of all stakeholders, including users, were incorporated. In the Netherlands, an example of an arranging strategy can be found in the *PGO in de Regio* case. The project received significant public funding in exchange for meeting deadlines that were discussed with the public actors who provided the funding. To ensure that the project would meet these deadlines, the coordinator installed various arrangements that

structured the project. Examples were weekly team meetings and monthly meetings with core partners. Further, the project had to be executed by the involved partners on top of their normal workload. Therefore, a clearly structured collaborative process was key to ensuring that the partners were able to plan their activities for the project thoroughly.

In the Belgian case of *MijnGezondheid*, two new coordinators were able to reinvigorate the dynamics in a collaboration that was almost at an impasse. They stimulated interaction, explored new possibilities, and were decisive at the right moment, which progressed the project. Several network management strategies were used here. The project involved a large variety of actors and the coordinators made sure they were included in the same meetings to stimulate interaction. The project coordinators used connecting strategies by paying attention to complexities and partners' concerns and focussing on areas where the opinions of the partners converged. However, the case study also underlines the importance of the decisiveness of the coordinator. When consensus between the partners could not be reached, the coordinator stepped in and made a decision that took into consideration the positions of the different partners. This decision-making by the coordinator reflects elements of hierarchical measures where a decision is imposed to resolve conflicts. Other TROPICO research[6] on collaboration within governments also found that hierarchical measures are sometimes used to resolve deadlocks and to let the project move forward, even in a collaborative network (Rackwitz, et al. 2020, 249).

b. Conflict management as an integral part of network management

Network management is important both for facilitating collaboration and for solving conflicts between collaborating partners. Our analysis points out that fitting and effective conflict management is important to ensure that conflicts do not escalate and endanger collaboration. The motives and interests that drive private and public actors to cooperate in innovation projects can result in conflicts regarding ownership of the innovation. On the one hand, public actors may want to retain ownership of the innovation so they can independently use it for

[6] See for example D6.3 of work package 6 of TROPICO: https://tropico-project.eu/publications/

their public service delivery. On the other hand, private parties are eager to retain ownership so as to sell the innovation to other clients and to hereby ensure future profits.

In several of our cases, matters related to intellectual property were not settled early enough, which increased the risk of intense conflicts between partners. The *Polycare* case in Spain and the *Burenondersteuning* case in Belgium are examples of this situation. They experienced conflicts because intellectual property issues were not settled upfront. In the *Polycare* case, the public partner did not want to be dependent on the private party to develop the application further in the future. Through the use of mediation, the intellectual property rights were eventually settled in a process agreement and the public partner were allowed limited rights to develop the application further for their own use. In the *Burenondersteuning* case, the aforementioned combination of a contract with network management strategies was used to solve the conflict. The private partner wanted to disseminate the innovation to other potential clients. The local government of the region where the innovation was developed and tested, which also contributed ideas for the innovation, wanted to be recognised for their work as well. This led to a significant conflict that ended in both parties signing a contract that settled the intellectual property rights related to the innovation. Before this contract could be signed, the positions of both parties had to be converged through interaction. This contract warded off the end of the collaboration. Both the public and private partners recognised that the discussion regarding intellectual property rights was held far too late in the innovation process.

Conflict between private and public actors also arises with respect to the level of customisation of innovations. Private technology firms are often inclined to use generic technologies and tools that can easily be applied in other contexts. Customising applications is costly and may lower the private partner's profit. Public organisations often want customised solutions that are tailor-made to specific situations. This was the case in the Danish *Dysphagia E-learning* case. The public hospital wanted to further fine-tune the application, while the private party did not want to invest additional resources for such customisation. During the development of the application, the partners reached a compromise. As a result, the company engaged in some of the fine-tuning (suggestions and

requests for further changes from the public partners, evaluated case by case), but did not accept every request as that would become too time consuming.

2.3. Dynamics and Activities in the Collaborative Innovation Process

Multiple lessons learned that were observed in the different case studies relate to a specific phase in the innovation process. In both the private and public innovation literature, several classifications of innovation processes have been described. Scholars admit that these phases are often blurry in reality and that innovation processes are often chaotic (Meijer 2014, 201). However, delineation is valuable for analytical purposes. Two main components of the innovation process can be distilled from Damanpour and Schneider's (2008) description—*the generation of ideas and the implementation or adoption of these ideas*. However, these phases are often preceded by *a problem awareness phase* and are coupled with each other by *a testing phase* (Rogers 2003; Meijer 2014). Based on this, we discuss **four distinct phases**: **1) Problem definition, 2) Idea generation, and 3) Testing of ideas**, and **4) Adoption and implementation of ideas**.

2.3.1. Problem definition

Most innovation processes initiate from an episode of problem awareness and problem definition (Rogers 2003), in which the problem that will be addressed by the innovation efforts in the project is delineated. Our cross-case analysis of the lessons learned indicates that the importance of this **problem definition phase** should not be underestimated. Different actors in the collaborative projects look a problem from their own perspectives and therefore can have different ideas about the central problem that the project should focus on. Several case studies indicate that it is therefore important to ensure that this problem is thoroughly discussed and clearly delineated. This definition of the central problem involves two aspects. First, a problem should be identified, and a clear scope should be defined. Second, the understanding of all partners with respect to this problem should reach maximal alignment. However, our research indicates that creative processes thrive in complex and ambiguous

contexts, which means that network managers need to keep a balance between rigid and unclear problem definitions.

The cases in our research employed different strategies to align all partners in terms of the proposed problem. In the Estonian *Centralised Digital Patient Registry*, the problem (decentralisation of patient registration) was already widely accepted among the partners as an acute problem that had to be tackled. This made the problem definition rather easy, as the problem was already considered crucial by the key partners. In the case of *Track AI* in Spain, a contract was used to ensure that the partners were in alignment regarding the problem. By clearly stipulating the objectives in the contract—which served as a framework for the collaborative process—the problem was unequivocally defined for all the partners from the beginning. In the Belgian *MijnWGK* case, a local pilot study set up by one of the partners raised awareness about the problem and clearly indicated to the partners as to what the intention of the *MijnWGK* project was.

Although not all innovation scholars view the problem definition phase as a part of the innovation process (see the earlier example of Damanpour and Schneider 2008), our cross-case analysis indicates that the definition of the problem certainly appears to be important. In projects in which a variety of actors collaborate, many different motives, knowledge bases, perspectives, and frames of reference come together. In such a situation, developing awareness, knowledge, and a shared understanding regarding the problem becomes more important (see also Klijn and Koppenjan 2014). This finding resonates well with the findings of other TROPICO research on the coordination of collaborative projects within governments. In addition, diverging perceptions regarding the purpose of the collaboration was a challenge for many collaborative projects (Rackwitz, et al. 2020, 243).

2.3.2. Idea generation

Innovation involves exploring new ideas. By collaborating, actors expect to link knowledge bases and experiences to develop a novel understanding of a challenge that is posed. In the **idea generation phase**, new innovative ideas are generated and proposed as possible

solutions to the defined problem. At the end of the idea generation phase, ideas are selected by the partnership from this pool of ideas. Damanpour and Schneider (2008, 497) describe the idea generation phase as "a process that results in an outcome that is new to the organisation" or the partnership. In partnership projects focussed on innovation, ideas often emanate from the interaction between partners (Sørensen and Torfing 2011, 842). In the case of *mobile health technology for women with osteoporosis*, workshops were set up with all the partners to generate ideas on how to tackle the problem. Through interactions and a focus on user needs, a prototype of the application was developed. In the Spanish *Track AI* case, the interactions between actors in the health field and the technological field were the main drivers of idea generation. This is an example of how collaboration between actors with divergent expertise can create synergistic interactions. When an agreement could not be reached, the partners focussed on the aspects of the ideas that were similar.

The divergent frames of reference and knowledge bases that come together during a collaboration enhance the exploration and co-creation of new and innovative ideas. Actors engage in learning processes and therefore achieve collaborative value (Austin and Seitanidi 2012). The experiences and perspectives of the actors are challenged in collaboration and are consequently transformed to develop mutual understanding. This process spurs the generation of novel ideas (Sørensen and Torfing 2011).

Our analysis of the case studies indicates that these interactions in the idea generation phase can also foster tensions. The *PROM* case in Denmark serves as an example of this. In the idea generation phase, different partners raised different ideas. Some wanted to use the app that was to be developed for research purposes, which justified the choice for standardised questions in the application. Other partners had alternate viewpoints. They wanted to concentrate on the daily use of the app, which focuses more on customised questions that take into account the characteristics of every department. Here, an unclear definition of the project's objective resulted in the generation of divergent ideas. Several respondents praised the coordinator for ensuring that all partners could voice their opinion, which indicates the importance of effective network management by the coordinator in the idea generation

phase. The users were included in the decision-making process, which was also highlighted as an important factor in resolving these tensions. This is an example of how the aforementioned network strategies and the influence of the partnership's structure (with the inclusion of users) play an important role in facilitating the interactions between actors during the idea generation phase. As mentioned, these interactions can lead to the generation of novel and synergistic ideas, but our analysis illustrates that interactions have to be facilitated and steered by a combination of network management and structural measures.

A similar finding can be noted in the *OZO Verbindzorg* case in the Netherlands. Early on in the idea generation phase, the project manager made sure that partners focussed on the cross-fertilisation of different ideas instead of concentrating on their own organisational interests. Consequently, the partners saw the collaborative value (Austin and Seitanidi 2012, 728) of their interactions, which motivated them to develop a better understanding of each other's perspectives.

2.3.3. Testing of ideas

Sometimes, innovation projects fail to implement the selected ideas successfully because of unforeseen difficulties in the implementation process. Hence, prior testing can be useful. Our cross-case analysis indicates that before the selected innovative idea is fully implemented, the innovation is often first tested or piloted on a smaller scale. Through testing, technological, organisational, and institutional barriers to the adoption of innovation can be identified (Meijer 2014, 202). This testing phase is a way to test the innovation in practise, while still allowing the partnership to make adjustments based on the feedback from the tests before the full-scale implementation commences. In other words, testing offers the opportunity to reconsider and refine, change, or discard the selected idea. In all of our cases, the testing phase was part of the innovation process. In various cases, this testing phase is considered an important factor for the project's success.

In the Estonian *CoNurse* case, the initially developed application showed some usability issues in the day-to-day practise of health professionals, as it was not geared to their working

routines. Feedback from the nurses was received during the testing phase, which enabled adjustments to be made to the application to increase its user-friendliness and reduce usability issues. The Danish *PROM* case offers a good example of a technological barrier that was identified through testing. Innovation was an application through which patients could report their post-operative progress from home. Patients subsequently received a green, yellow, or red score. A red score indicated that the patient required follow-up at the hospital. However, the algorithm was programmed to be too sensitive and almost always resulted in a red score. By testing the application first, the nurses in the test environment detected this problem and highlighted that many normal side effects were inaccurately determined to be problematic by the application.

In the Belgian case of *Burenondersteuning*, the initial idea was to use the Internet-of-Things (IoT) to tackle the problem that was defined (i.e., loneliness). When seeking user feedback regarding this idea, the partners learned that citizens were not entirely comfortable with the notion of an Internet-of-Things solution in their private life. The users' concern regarding their privacy and their adverse feelings toward technology intruding their private life functioned as a significant psychological barrier. This barrier was identified through testing, and the partners eventually reconsidered the originally selected idea. The eventual success of the project was largely due to the partnership's open mind and willingness to go back to the idea selection phase and utilise the user feedback to identify a better solution for the problem. In the Estonian case of the *Centralised Digital Patient Registration*, no barriers to the effective implementation of the innovation were identified during the testing phase. However, the testing proved to be valuable in stimulating healthy interactions between the partners. All key partners were invited to join the testing sessions. This fostered interactions among the partners and enabled them to develop a mutual understanding, both of which were lacking during the idea generation phase of the project.

Our analysis further indicates that testing has to be accompanied by a good dialogue with the users who perform the testing. To increase the quality of their feedback, the users involved in the testing must be thoroughly instructed on the purpose and use of the innovation. The

Spanish *track AI* case serves as a good example of this. The innovation developed in this project was quite high-end and technologically sophisticated. The innovativeness and high-end technology necessitated that the use and purpose of the application be appropriately explained to health professionals. Every patient and health professional involved in testing was clearly informed about how the innovation had to be used and how they were meant to provide feedback. Successful testing with patients (and health professionals) proved to be an important factor of the success of the project. In the case of *OZO Verbindzorg* in the Netherlands, the project team even set up a secretariat during the testing of the application. This secretariat drafted protocols on how to use the tool and organised training sessions to get professionals acquainted with the developed tool (i.e., a digital communication platform).

2.3.4. Adoption and implementation of ideas

After the innovation is fine-tuned, such as through testing, the innovation can be adopted or implemented. Damanpour and Schneider (2008, 497) define the adoption of innovation as "a process that results in the assimilation of a product, process, or practise that is new to the organisation." Several barriers can emerge during the implementation of the innovation. Meijer (2014, 202) draws attention to potential financial and capacity barriers, while Damanpour and Schneider (2008) emphasise the influence of the characteristics of the innovation itself and of managerial capacities. In our analysis, the commitment of stakeholders to implement the innovation was identified as the most important factor for successful implementation.

In the case of *Smart Dementia* in the Netherlands, the partners strongly believed in the positive impact that the innovation would have on the patients' quality of life. In the case of the *Central Digital Patient Registration* in Estonia, the core partners had invested considerable resources into the project. Therefore, they were committed to succeed. Another example is the *MijnGezondheid* case in Belgium, where the coordinator ensured that the other partners were committed to facilitating the implementation of the innovation in their organisation by using a 'name or shame' approach. The coordinators openly pointed out when actors were lagging behind in the implementation of the solution. Conversely, actors that were ahead in

their implementation were publicly praised for their endeavours. The coordinators were able to take on this approach as it was a governmentally coordinated partnership that was to be implemented across the entire health sector. It was difficult for actors to exit the partnership because they would not have been able to reap the benefits of the central platform that every other actor had access to. Hence, the commitment of actors can be inherent to the innovation process or can result from the characteristics of the innovation or the problem that is being addressed. In other cases, commitment had to be actively established by the coordinator. In the latter scenario, actors must be motivated to implement the innovation.

Similar to the testing phase, the implementation phase has to be accompanied by support for the users to guide them through the change that the innovation will bring about in their everyday working practise. In several cases, adequately supporting health professionals and patients during the implementation process was highlighted as an important factor in the success of implementation. In the *OZO Verbindzorg* case in the Netherlands, the secretariat that was set up in the testing phase developed a transition plan to effectively roll out the innovation—a digital communication platform—throughout the entire municipality. An important aspect of this plan was the training of all professionals. In the *Smart Diaper* case, which was also implemented in the Netherlands, an agency that specialises in change management was brought in to support and guide the change that the new application would bring about for the employees of the elderly care organisation. The attention that the nurses who had to work with the diaper received from the partnership was particularly acknowledged as being important to the project's success. However, at certain moments, technical problems arose that could not be addressed by the change management agency and had to be remedied by the technological partner. This case study indicates that a single contact point for all feedback might have been better and could lower the threshold for users to provide feedback. This single contact point is then able to redistribute the feedback of users to the concerned partner within the project team.

2.4. External context of the partnership and external support for innovation

Having addressed the internal dynamics and activities of collaborative innovation processes, it should be noted that digital innovation projects do not occur in a vacuum. The impact of the external context on collaborative partnerships cannot be underestimated. **Political support** is often important to ensure funding and legitimise the innovation process (Cinar, et al. 2019). In the analysis of our case studies, the importance of political support for the success of collaborative projects was primarily highlighted in the case of governmentally coordinated partnerships.

In the Belgian *Booghuys* case, the partnership was set up to construct a new nursing home in which all kinds of new technologies were integrated to address the specific needs of the residents with dementia. Local politicians (especially the responsible alderman) were supportive of the project. This was important because elected politicians decided on both the budget and the general concept of the new nursing home through a decentralised government organisation called '*Zorg Leuven*',' which was partially governed by these politicians. The support of these local politicians thus gave the project team ample room to explore different ideas, which largely contributed to the project's success.

Political support can also grant the coordinator the necessary authority to implement the innovation. The Estonian *Centralised Digital Patient Registry* project was highly dependent on the willingness of health professionals and organisations to use the newly created platform. The government desired a centralised patient registration system that could be linked to the existing eHealth infrastructure. Since some health care providers had their own registration platform, they were reluctant to change their modus operandi. However, the political support for the project persuaded healthcare providers to adopt the new platform, which contributed to the success of the project.

Conversely, a lack of direct political support can also hamper the success of the partnership's output. In the Estonian *CoNurse* project, the Ministry of Social Affairs opted to remain neutral

because CoNurse was a private initiative, and thus contributed through indirect support. This resulted in an unclear role division and limited communication, which consequently created a difficult relationship between the coordinator and the ministry. This limited the willingness of the coordinator to operate within the Estonian market.

In societally coordinated projects, the **support of higher management levels** in organisations was presented as a crucial element. The Dutch *Smart Dementia* project in Bergen-Op-Zoom and the *Smart Diaper* project mentioned that the commitment of top-management to the implementation of innovation was a key success factor. In both cases, the problem defined at the start of the innovation process was widely recognised throughout the entire organisation. Both innovations were initiated by the nursing homes themselves and were seen as an important step towards making the involved organisations future-proof.

Another important external condition that our cross-case analysis highlights relates to **environmental conditions or the 'system context'** (Ansell and Gash 2008, Emerson, et al. 2011) which can either facilitate or hinder innovative projects. For example, in Estonia, certain collaborative innovation projects are supported by the government through an innovation programme, which facilitates public service redesign through open innovation and user-centred methods. In the case of *proactive service provision for disabled people*, this framework was mentioned as a key facilitator of the project. The Dutch *Smart Diaper* project was part of a governmental programme called 'Care hospitals for the future'. This generated some attention from the media and politicians and motivated all the partners to ensure that the project was successfully implemented. The project also won several prizes, which were followingly publicised by the project team.

2.5. User involvement in innovation process

As mentioned several times in this report, user involvement has gained traction in public sector innovation projects over the last few decades. Concepts which emphasise the involvement of users in innovation processes, such as 'open innovation' (Chesbrough 2003)

and 'co-production' (e.g. Voorberg, et al. 2015), have gained scholarly interest since the beginning of the millennium. Generally, user involvement refers to **the development of innovation *with* users, not only *for* users**. In the eHealth innovation cases that are explored in our research, users were mostly health professionals, general practitioners, and medical staff (15 cases). In ten cases, patients or patient representatives were also involved. The involvement of users in the innovation process is believed to increase the relevance, user-orientedness, and practical feasibility of innovations (Baldwin and von Hippel 2011). As the interaction with users or other external stakeholders during the innovation process was one of the criteria for the selection of the cases, our cross-case analysis reveals some insights regarding the manner in which this user involvement is applied in eHealth innovation projects.

The first general observation from our analysis of cases was the substantial effect of user involvement on the created services. For instance, in the Belgian *Burenondersteuning* project, the whole concept of innovation changed when users became involved in the innovation process. After involving the users, it became clear that they should not use an Internet-of-Things (IoT) solution because such technologies would invade the users' privacy and personal space. This caused the collaborating partners to reorient their innovation concept towards other technologies (i.e., phone technology), even though they promised the Flemish government (the subsidising actor) that they would develop an IoT solution. A less profound but still significant impact of user involvement is visible in the other cases, where user involvement was fairly instrumental in improving the ICT tool, identifying errors, and, more importantly, detecting problems in the implementation of the tool. Next, we will look at two dimensions that were highlighted as important for a successful user involvement in our cases: the timing of user involvement and the intensity of user involvement. Following that, we will explore the barriers to user involvement.

2.5.1. The moment of user involvement

The first dimension that was found to be important in the case studies is the timing of user involvement. Several cases illustrate the importance of the early inclusion of users, which ensures that the users' input can be applied to ideas that are not yet rigid and can still be

adapted. In the Belgian *MijnWGK* project, the involvement of users in the idea generation phase was a critical success factor. Further, a pilot project was initiated by users (general practitioners) before the start of the project. Both the inclusion of users and the execution of the pilot project provided important information for idea generation. In the Danish *Dysphagia e-learning* project, users were included in the problem definition phase. A survey of users was conducted to further delineate the main issues regarding the treatment of dysphagia. After the survey, seminars were organised to invite private partners to generate ideas. Involving users as early as the problem definition phase caused stakeholders to be highly motivated to implement the innovation.

2.5.2. Intensity of user involvement

Another aspect of successful user involvement is the intensity of user involvement. This concerns the way in which users' input is taken into account in decision-making. Arnstein (1969, 217) developed a way to conceptualise citizen participation by constructing a ladder of participation. This 'participation ladder' consists of eight levels of participation. In an attempt to avoid overcomplicating our analysis, we simplify the levels using six distinct categories. First, users can be involved in merely listening to what the partners have to say. At this level of user involvement, active involvement is not sought. Second, users can be consulted by the partnership. This involves the collaborating partners posing several questions to the involved users, which the users are expected to answer. Third, users can be involved in advising collaboration partners regarding their demands. Fourth, users can collaborate with other partners and co-produce innovation. Fifth, users can be involved in making important decisions in the innovation process. Sixth, users can be involved in the innovation process.

2.5.3. Barriers to user involvement

A combination of factors can limit the capacity of the project team to incorporate feedback from users in the innovation process. The Spanish *Polycare* project experienced delays and setbacks during its early stages. The project team underestimated the complexity of home hospitalisation. When the testing phase arrived, the tight and rigid deadlines limited the number of patients that could participate and did not allow for much change to be

incorporated. Due to the lack of time, the level of user involvement remained modest (at the first levels of user involvement) and did not imply a real delegation of power to the users. In the Dutch *OZO Verbindzorg* project, the involvement of users was rigidly organised. The project team even used a strict protocol with instructions on how feedback had to be provided to the ICT partner. Some respondents indicated that there was a lack of openness in this process. The strict conditions for user involvement meant that users were not always able to communicate their preferences and opinions to the ICT partner. Users' preferences and opinions could therefore not be considered in decisions about the design of the innovation. In the Netherlands, the project team of the *Smart Diaper* foresaw such problems. Thus, the capacity to incorporate feedback from users was built into the innovation process. The project team ensured that there was enough time left for trial and error in order to optimise the innovation and incorporate user feedback in the application. This was necessary because users were not involved in the design process and several flaws in the design pertaining to the comfort and the effectiveness of the device could be identified by the users.

Conversely, in some cases, the user involvement was well-organised, thereby allowing the project partners to overcome these barriers and involve the users more intensely in the innovation process. An example was the *Track AI* project in Spain, which was conducted in collaboration with several European countries. Medical centres in five different countries were invited to issue feedback on the developed application. The application was quite technologically sophisticated, and the same procedures had to be used with every patient. Collaboration agreements were made with the medical centres in which they were clearly instructed about how to use the application and how and when feedback could be sent to the project team. As a result of these clear instructions and feedback options, the user involvement was successful. The tool was optimised through user feedback, and certain flaws were fixed. The wide sample was also a good way to validate the developed tool.

2.6. The role of ICT in fostering collaboration and innovation

Over the past few several decades now, **Information and Communications Technology (ICT)** has influenced the manner in which public organisations design and deliver their services (Dunleavy, et al. 2005, Margetts and Dunleavy 2013). Our research shows that ICT also plays a key role in the development of digital innovations through collaboration. In the majority of the 19 cases of digital innovation projects in the health sector that we examined, ICT influenced the collaborative innovation process, by serving as a tool to involve users in the development of the innovations. ICT was used to create test environments that allowed the users to test the applications and enabled users to provide feedback and suggest improvements to the application. Mock-ups of websites and tools were frequently used to let the involved users test the innovation. In the Belgian *Evidence-based practice (EBP)* project, the network added a function to their platform through which the network members could give feedback on newly added content, such as websites and articles. In other cases, such as the Danish *Dysphagia e-learning* project, the Belgian *Booghuys* project, and the Dutch *Smart Dementia* project, a controlled testing environment, in which users could test the innovation using technologies on a small scale, was set up and users were subsequently consulted regarding their experiences with the new developments.

In some cases, ICT tools were used to aid the partners in the development of the innovation. For example, in the Belgian *Burenondersteuning* project, the private partner used a tool to visualise the process flow of the new service that they wanted to develop. This helped the other partners develop an understanding of what the private partners' idea was and how the innovation would be used. In the *Mobile health technology for women with osteoporosis* project in Denmark, the private developer gave the coordinator access to the backend of their program. Thus, the coordinator could directly add content to the application without having to turn to the developer for help. This made the collaboration more efficient. The *Mastermind* project in Spain was a European project that had partners in different European countries. They used a central data platform that made it easy to share data with all the partners across Europe.

Another way in which ICT greatly influenced the innovation process was through the available ICT infrastructure. Past digital transformation efforts have created a digital infrastructure that greatly affects collaboration between partners and the development of eHealth solutions. National eHealth infrastructure such as the eHealth platform in Belgium and the X-Road in Estonia are examples of such ICT infrastructures. Projects such as *MijnGezondheid* and *MijnWGK* in Belgium and the Estonian Proactive service provision for disabled people would have been very different without these national eHealth infrastructures. For instance, the Belgian eHealth platform made it possible for the WGK organisations in the *MijnWGK* project to use the large eHealth network as a data vault, thus making it possible to connect to other eHealth databases through a single sign-on. The eHealth platform facilitated a closer collaboration between various health actors and also made future collaborations between new health actors easier (as these new health actors can connect to the eHealth platform and become part of the interconnected eHealth network).

However, existing ICT infrastructure might also present new challenges related to the compatibility and interconnection of the developed eHealth solution. For instance, this was the case in the Spanish *Mastermind* project, where delays were caused by the incompatibility of the application with the existing infrastructure. Moreover, the internal design logic of the existing infrastructure can also shape the collaborative environment and can even impact the collaboration itself (Kattel, et al. 2019). The *Proactive service provision* case in Estonia serves as an example of this. The Social Insurance Board is the only actor in the Estonian health field that determines disability levels and the corresponding support to be provided. As the innovation made use of the national digital infrastructure, the application had to use the same data format and also the same support measures that correspond with the disability of users. Estonia is well-known for its national digital data exchange infrastructure called the X-Road[7]. The design of applications must take into account the design of this infrastructure as they have to be connected to these data flows. In the case of the *Centralised Digital Patient Registration*,

[7] X-Road is the Estonian e-government backbone. It provides a unified, secured data-exchange and communication platform for various public and private organizations (Paide, et al. 2018, 34).
More info on the website of e-Estonia: https://e-estonia.com/

the solution had to be designed with the X-Road in mind to utilise other eHealth innovations such as digital referrals.

Some of the Belgian cases also highlight the influence of existing architecture (e.g., hospital hubs) on the design of innovative digital applications. In the *MijnGezondheid* case, the initial idea was to develop a personal health record. However, a personal health record would have been difficult to align with the decentralised hospital hubs and would have meant a complete reorganisation of the hospital hubs. To prevent the project from becoming completely stalling, the idea was changed to a personal health viewer that redirects the patient to his or her medical information (instead of building a single interface which centralised all the user requested information).

2.7. Recommendations

Collaborative innovation has become a prominent method of public sector innovation. Although public sector innovation processes are embedded in and influenced by the context in which they take place, our cross-case analysis of digital innovation projects in the health sector allows us to formulate twelve general recommendations for practise. The following recommendations are a synthesis of a more extensive series of recommendations which are published in the annex of the policy brief (Deliverable 7.3)[8].

2.7.1. Diversity of actors

In a collaborative innovation partnership, a variety of actors with divergent motives, perspectives, interests, resources, and internal processes is needed to solve complex problems. However, this initial diversity determines interdependencies and influences the collaborative process. At the same time, the coupling of knowledge and resources is one of the virtues of collaboration and enables the partnership to generate outcomes the partners

[8] See TROPICO work package 7 publications: https://tropico-project.eu/publications/

cannot achieve (as efficiently) on their own. Therefore, the proper selection of partners is crucial.

2.7.2. Tension between steering and exploring

Collaborative innovation processes are highly complex scenarios in which a high degree of variation is present (e.g. a, multitude of actors, interests, knowledge, and perspectives, etc.). This presents a dilemma. On the one hand, managers need to streamline the innovation process to ensure that objectives are met, and results will be achieved. As such, network managers need to control the innovation process and stimulate the convergence of the process toward one outcome (i.e., the created service). On the other hand, innovation thrives in circumstances of high complexity and variation, where learning dynamics unfold, and new ideas arise. Controlling the process too much extinguishes the rich variation and explorative potential of collaborations that stimulate learning processes. **Network coordinators need to be aware of this tension and balance the contradictory dynamics to stimulate innovation and learning** (e.g., through particular network management strategies), **but simultaneously manage the complexities related to collaborative processes** (e.g., through employing a governance structure, contracts, etc.).

2.7.3. Aligned objectives

The partners want to achieve their personal goals as efficiently as possible, but are unable to reach these goals on their own, which creates the need for a collaborative partnership. Every partner has its own motives for participating in collaboration. Therefore, the **collaborative partnership must ensure that every partner creates value for themselves through their participation in the collaboration**. Otherwise, the partners will not participate or might leave the partnership. Creating shared ownership over innovation is an example of how a partnership can create such value. Additionally, the partnership needs to ensure that the efforts directed at achieving individual goals are aligned with the general objectives of the partnership. Therefore, the partnership has to engage in common sense-making to align different perspectives. This can be done through deliberation with all the partners or through the participation of relevant stakeholders (e.g., users, patients, etc.). In other words, a delicate

balancing act is necessary between the actors' individual goals and the shared goals of the partnership. Properly balancing these dynamics creates synergy and value for all partners and also for the collaboration.

2.7.4. Governance structure

In a collaboration, ideas are generated through interaction between partners. **A clear governance structure is crucial to stimulate these interactions while clarifying every partner's role and responsibility.** This governance structure can further ensure the inclusion of important stakeholders and explicate decision-making processes. A steering committee can follow up on the overall strategy and progress of the project. Project teams or expert groups can bring together actors around a specific topic or issue. In any case, clear communication between the different levels and bodies of the governance structure is important. A governance structure is primarily a means to enhance interaction and coordination and cannot replace informal or ad-hoc interactions between partners. Governance structures that become too rigid and bureaucratic (in the sense that the governance structure is the only way in which the collaboration can be conducted) are detrimental to the collaborative innovation process as it lowers the ability of partners to freely interact with each other, which is harmful for creative processes.

2.7.5. Contract management

A contract is **an effective instrument to manage uncertainty and risk in the face of complex and diverse innovation partnerships**. Partners with various backgrounds come together, which creates a lot of complexity and uncertainty related to the inherent variation of the involved actors. Specifying the outcome of the collaboration in a contract ensures that every partner is aware of the exact goals and demands of the collaboration. It is also a means to select the appropriate partners (i.e., partners whose interests and motivations are aligned with those of the partnership). Owing to the legal enforceability of the contract, it can also specify the responsibility and accountability of each partner. A proper contract ensures that disruptive and distracting dynamics (e.g., discussions or conflicts about responsibilities,

intellectual property, desired outputs, etc.) are prevented. This allows partners to focus on the core activities of the innovation process, that is, developing the innovation.

2.7.6. Network management strategies

By employing process rules and network management strategies, actors and their resources are effectively activated and steered towards desired outcomes. Furthermore, actors can be engaged in mutual learning, trust building, and the generation of innovative ideas. Connecting strategies start the collaboration process, exploring strategies stimulate the generation of new ideas and arranging strategies structure the interactions. Process rules are temporary rules that structure the collaborative process. Think of veto possibilities, internal rules of decision-making, rules for entrance, etc. Network management increases the exploration of diverse perspectives and opinions and facilitates interactions between the partners, which is crucial for both the generation of new ideas and the commitment toward the implementation of these ideas.

2.7.7. Testing innovations

Ideas are generated through interactions and then selected for implementation. **The implementation of innovative ideas in a real-world environment can encounter technical, organisational, and institutional barriers that can be identified through testing.** Testing enables a return to the idea generation or idea selection phase to further refine the ideas to overcome the identified barriers. It also immerses the innovation into a real-life situation. This generates feedback on the applicability of the innovation for that environment, while simultaneously shielding innovation from the negative consequences of those environments (e.g., high competition). Testing is also a useful instrument for generating user feedback on developed ideas. This feedback can be used to further refine the innovation to make it more aligned with working procedures and improve its usability. It also stimulates the interactions between partners as it illustrates the anticipated effects of the solution and may generate discussion and mutual learning.

2.7.8. User involvement

Users have important knowledge of everyday practises and working procedures. This knowledge is valuable for problem definition and idea generation. **It can contribute to a more thorough understanding of the problem and the generation of ideas that are feasible and address the issues that confront users daily.** Further, when involving users in the innovation process, they have to be granted a real voice and substantial power to influence the innovation process. User involvement is only effective if it is stimulated through the active engagement of users (letting users voice their preferences, letting users test the innovation, co-producing with the users, etc.) and if the innovation process is influenced by the users (i.e., the innovation is modified based on the feedback of users). The participation of users is valuable when it transcends symbolic participation and actually influences decision-making.

2.7.9. Commitment

In complex partnerships such as collaborative partnerships, **the commitment of actors to implement the innovation is crucial as it ensures that actors are willing to spend resources to adopt the innovation.** It is easier for the partners to let other partners implement the created innovation and later adopt it when it has proven its worth. However, this undermines collaborative innovation efforts, as no actor is willing to take the risk of implementing something new. As a result, no innovation is actually adopted. It is therefore important that this commitment is promoted by the coordinator of the network. Further, managerial activities can ensure commitment towards the implementation of innovation. Emphasising the collaborative value for each partner can generate commitment among partners. The behaviour of the coordinator of the network can empower and motivate actors to make progress towards the implementation of the innovation.

2.7.10. External support

In public sector innovation projects, political support is crucial for success. In governmentally coordinated partnerships, political support is often important for ensuring funding and legitimising the innovation process. Additionally, decisions often have to be approved by elected officials. Political support can then give the project team some autonomy to explore

new ideas. Similar to the support from elected officials, support from the higher management levels of organisations is also crucial. Innovations that are generated in collaborative partnerships will be implemented in the organisations of the collaboration partners. Therefore, support from the organisations involved in the partnership is crucial for eventually implementing the innovation. Furthermore, organisations support partnerships by providing certain resources, without which the partnership is unable to function properly. Thus, strategies that stimulate support from the higher management of these organisations are essential.

2.7.11. ICT infrastructure

Existing ICT infrastructure has a great influence on digital innovation processes. **As many innovations aspire a smooth exchange of data and information, it is important to consider compatibility and interconnection when developing applications.** The presence of existing ICT infrastructure can also shape innovative outcomes, as many technological innovations use the available ICT-infrastructure for their functionalities. Especially in the eHealth sector, many European countries already have regional or national data sharing platforms which are useful for new eHealth services. Connecting new services to these platforms ensures interconnectivity and interoperability, which should increase the usability of the new eHealth services. It should also make the new eHealth services more sustainable as they become part of a larger eHealth system which keeps adapting to current needs.

2.7.12. Use of ICT

ICT tools are valuable tools to foster collaboration between the partners. Their benefits are manifold. As interaction between actors is the very essence of collaboration, they can enhance these interactions and help overcome practical barriers for communication. Further, ICT can visualize and structure innovative ideas to generate support and understanding of these ideas. ICT tools can also be used to develop prototypes and testing environments to involve users in the collaborative process. They can be used to support users in their use of new and technologically sophisticated innovations. Finally, ICT can also be of use when gathering feedback from a diverse and large group of users.

3. Case studies

This chapter provides a detailed description of all the case studies. The case study descriptions are based on information from the interviews with project participants and from available project documents, which is tied to the interpretation and evaluation of the project coordinator, partners, and involved users. The case study descriptions are divided in two categories, namely '*Collaborative eHealth innovation to create administrative simplification and digitalization of data sharing*' and '*Collaborative eHealth innovation to create telehealth and mobile health tools and smart devices'*. We use a slightly altered structure in comparison to chapter 2 to discuss the results.

First, an introduction for the case study is provided, with information about the purpose, goals, and outcome of the project. The introduction also outlines the timeline of the project and some general characteristics of the innovation process. Second, the eHealth innovation itself is described in detail. Information about the technologies and usage thereof is given. Additionally, an assessment of the innovativeness is provided. Third, the partnership structure, governance and resources are described. This part provides information on the actors that were involved in the partnership, how the partnership was governed in terms of the meeting arrangements that were used (e.g. steering committee, projects teams, etc.) and how the actors were configured in the partnership (i.e. if there was one lead actor or a shared collective of partners). Furthermore, the resources of the different partners and how these resources were divided in the partnership is outlined. Fourth, the network management of the partnership is assessed. We look at the network management strategies that were used in the case to stimulate the collaborative efforts in the partnership. Fifth, we take a closer look at the activities and dynamics in the innovation process by examining how differences between partners and learning processes where used the create new ideas and how consensus was built between the partners to converge to a specific solution. Sixth, the strategies the partnership used to ensure external support of elected politicians, the broader eHealth sector and the media are outlined. Seventh, we look at how users were involved in the partnership and how this user involvement stimulated the innovation process. Eighth, the

role of ICT in the collaboration process is depicted, as ICT had in many cases an important influence on the collaboration and innovation processes. As the section on the eHealth innovation emphasizes the advantages of the technological components of the innovation for the newly created services, this section will only look at how ICT was used to stimulate the collaboration/innovation *process* (and not the outcome). Last but not least, we formulate for each case some success factors which were extracted from the case studies.

3.1. Collaborative eHealth innovation to create administrative simplification and digitalization of data sharing

3.1.1. Dysphagia E-learning (Denmark)

Lena Brogaard, Roskilde University (RUC), Denmark

Introduction of the project

The purpose of Dysphagia E-learning was to develop new innovative solutions for health professionals and patients that can prevent deaths, pneumonia and malnutrition for patients and citizens with dysphagia. Dysphagia refers to a condition where a person has difficulties swallowing (food, drinks and saliva). If untreated and/or undetected, it can lead to risk of suffocation, pneumonia, dehydration and malnutrition (Tvilsted et al., 2016).

The project was very much focused on ensuring the creation of a solution that would benefit everyone in the project: 1) that it would address the needs of the public partners in dealing with dysphagia; 2) that the private partner would gain a commercially viable product that would be purchased by the participating public partners; and 3) that the solution would be implemented. There was, in other words, a strong focus on not just developing a new solution but also on ensuring the implementation of the solution.

Based on the objectives and the phases of the project, the project is best characterized as explorative. The purpose was to come up with new ideas that would result in a new product

and working procedures rather than to refine existing practices. Furthermore, the process was characterized by a continuous circle of input, user-feedback and changes, on which the subsequent sections will elaborate.

The project was initiated in 2013 with a pre-study phase aimed at identifying the most urgent problems in healthcare in Region Zealand[9] (where the project was anchored) which would be possible to solve through an innovative public-private collaboration. Hence, the intention was from the beginning to involve private partners through innovation partnerships, as the region had designated funds for this type of project. The pre-study phase resulted in the identification of dysphagia as a pressing concern in both hospitals and municipalities.

The pre-study was followed by a second phase consisting of a user survey, where the public/user representatives in the project group identified which specific challenges their own colleagues, patients and patient relatives experienced with regard to dysphagia. This led to a focus on three particular problem areas: food/meals, patient empowerment and knowledge/competencies among health staff.

In the third phase, the private partner was found through a seminar in 2014, where several businesses were invited to present their proposal for an innovative solution for the problem of dysphagia, focusing on the three problem areas identified in the second phase. After the seminar, seven businesses submitted a proposal or statement of interest in participating in the project. The public partners narrowed it down to two possible solutions that were the most relevant based on the different proposals (Tvilsted et al., 2016).

The first solution turned out to be too time consuming and expensive to develop within the project (an instrument to measure viscosity of liquids). The other proposed solution, an e-learning program to help boost health professionals' competencies within dysphagia, was chosen as the most viable solution for development and implementation. Several businesses

[9] There are three tiers of governance in Denmark: municipal level, regional level and national level. Denmark is divided into five regions, which are mainly in charge of the hospital sector. However, they collaborate with the municipals in regard to healthcare, as the municipals are in charge of home-care, when patients are discharged from the hospital.

were in the running for developing this solution. Based on dialogue with all of them, KvaliCare was chosen as the best private partner. It was originally the intention to also include a second business from the gaming industry, but this particular business opted out during contract negotiation, as it found the potential of participating too uncertain.

After these initial phases of problem and solution identification, the public and private partners proceeded with successfully developing and implementing the e-learning program, which included a user-test phase (see Figure 6). In the user-testing phase, health professionals from nursing homes/day centres and a rehabilitation centre tested the e-program and provided feedback on, e.g. its relevance and user friendliness.

Figure 6: Key phases of Dysphagia E-learning

The eHealth innovation

The innovative output of the project was an e-learning program aimed at improving the competencies of health professionals or employees working with the target patient/citizen group in detecting and responding to symptoms of dysphagia. This technology thus supports health professionals by providing inter-professional collaboration, as health professionals have been in charge of the information shared in the program, which is again accessed and used by other health professionals. The program is accessed online and entails a combination of videos, text, pictures and sound, where the user is presented with important information about dysphagia (e.g. symptoms and complications) and quizzed in their own knowledge (e.g. which citizen/patient groups in your daily work are more prone to dysphagia).

While e-learning is not a highly innovative, technological solution, there was no equivalent solution at the time in this field and it represented a highly efficient way of reducing complications resulting from untreated dysphagia. The alternative was in-person courses and workshops taught by experts. From this perspective, it was quite innovative at the time. Since

then, e-learning in healthcare has proliferated in just a few years. Moreover, according to the public partners and user representatives that were interviewed, it has addressed the challenges identified initially in the project in regard to dysphagia. The health professionals that have completed the program have reported a boost in their competencies and more cases of dysphagia have been detected and treated.

The e-learning program is fully implemented in a few municipalities and hospitals in Region Zealand, where the health professionals at, Koege Hospital and Koege municipality are encouraged to complete the e-learning program. It has not been implemented beyond this region yet.

Partnership structure, governance and resources

The partnership was organized in two levels with a steering committee and a project team. The coordinator was the primary communication link between the two levels, making sure that the steering committee was informed of the project's progress. The coordinator represented the Production, Research and Innovation Unit in Region Zealand, which was in charge of the project. He was not initially the coordinator but became the coordinator early on. The steering committee consisted of leaders and managers from Region Zealand, Roskilde and Koege hospital, from the participating business and from Roskilde Municipality. The steering committee was not particularly involved except for one person, who was the project owner and had the idea for the partnership to begin with. The project team represented the core partners, consisting of a representative from the business KvaliCare, nurses and occupational therapists from two hospitals and two municipalities in the region as well as an educational consultant (Tvilsted et al., 2016).

The public partners in the project team were also user representatives as the e-program was, among others, oriented towards nurses and occupational therapists and physiotherapists in regions and municipalities. The core partners and user representatives participated because they were all considered experts in dysphagia at hospital or municipal level and the project needed their knowledge in the field. They provided human resources in terms of knowledge

and experience in working with patients and citizens with dysphagia and knew the working procedures at hospitals and in municipalities. Their own motivation for participating was that they could see an urgent need for boosting the competencies of their colleagues to help them detect and manage symptoms of dysphagia in nursing homes, at hospitals and the like.

The most important resource present in the project were the human resources provided by the private business (expertise and technology in e-learning) and the public partners/user representatives (knowledge and experience with dysphagia) as described above. The financial resources were provided by the Region through the Production, Research and Innovation Unit, which had funds designated for public-private innovation. The coordinator provided process-related resources, facilitating the collaboration and ensuring progress.

The partnership is best described as a network administrative organisation (Provan and Kenis 2008). The coordinator came from a separate entity, the Production, Research and Innovation Unit in Region Zealand, which did not constitute a collaborative partner like the participating business or the public hospitals and municipalities. The coordinating unit had a designated role as project leader with the purpose of facilitating the collaboration between the partners.

Network management

The project was, according to the interviewed parties, very easy-going and not characterized by much conflict or tension. However, it does appear that there were two issues, which arose during the project. The first issue stems from the different perspectives of hospital and municipal representatives respectively. As their working procedures differ, e.g. in terms of how to respond to symptoms of dysphagia, the public partners disagreed on what the e-learning program should contain. This, however, did not become a conflict, as they were all intent on finding the best solution. The compromise was to have different entrances or user interfaces for the program depending on the user's place of employment. The project leader helped facilitate this by continuing to emphasize the focus on the common problem as a starting point. Based on this, the network management strategies can best be characterized

as an exploring strategy, where there was a focus on goal congruency and creating variation in the developed solution (Klijn et al. 2010).

The other issue was related to the interaction between the business and the public partners. The business was reluctant to keep making changes to the e-learning program, as this incurred extra costs and time for the business, while the public partners kept pushing for more "fine tuning" of the program. The business was thus sometimes faster at pushing decisions through than the public partner. The business also became frustrated once in a while, as the public partners would cancel meetings on late notice, thus giving the impressing that they did not prioritise these meetings to the same degree as the business. It did not become clear from the interviews how this tension was dealt with, but the business representative mentioned that they expected it and none of the interviewees gave the impression that it led to any conflicts.

Dynamics and activities in the innovation process

The partnership was very dynamic, as ideas were generated through interaction, discussions and dialogue among the public partners and between the users, the public partners and the private partner. For instance, as described under 'Phases and results', the first part of the partnership was oriented towards identifying user needs and key problems related to dysphagia. In this process, the public partners had many discussions, where they shared examples and experiences from their respective organisations and through these discussions agreed on the main challenges to be addressed through the partnership. None of the interviewed parties gave the impression that some people wanted to push their ideas through in comparison others. There was an open dialogue and a genuine interest in learning from each other, where the coordinator continuously encouraged them to focus on common problems and solutions.

In general, the partners were from the beginning very intent on developing a solution that would make a difference in practice and be put to use (i.e. implementing the solution). The user-representatives and public partners were thus frontrunners in promoting the e-learning

program within and outside their own organisations to reduce complications from undetected cases of dysphagia.

Strategies to achieve societal support for the innovation

Creating societal support was not a major focus of the project. Consequently, there were no strategic efforts to achieve societal support from certain actors. However, there was a general focus on public-private innovation partnerships at the time, which meant that local politicians in Region Zealand were aware and supportive of the project. There was also some media attention throughout and after the project, where some of the public partners and user representatives were interviewed by local newspapers. Finally, the fact that representatives from different organisations in the region were invited to participate in the steering committee and project team may have had the positive effect of creating support for the project and facilitating wider implementation of the e-learning program.

User involvement

The project can overall be characterized by a relatively successful user involvement and high degree of user-driven development and implementation. The success of the project is directly related to the fact that users were involved throughout the whole project and that the entire project was based on user-needs. The involved users were highly motivated, as they recognized the need for the e-learning program and the societal costs of this problem. The logic behind involving users in this project is closely associated with the implementation focus of the project; the more relevant and helpful the solution is for the users, the more likely it is that it will be successfully implemented.

User involvement happened in two ways and at two levels. First, the public partners were user representatives, as already described, who also represented experts in the field of dysphagia. Second, the project included a user test phase, where users outside of the project partners tested the e-learning program. It was difficult in this phase to find enough users that were motivated to test the solution in a hectic daily schedule. These primarily included social- and

healthcare assistants as well as nurses from hospitals and municipal nursing homes/ rehabilitation centres.

While the user representatives in the project team were involved throughout the project, the users in the designated test phase were only involved towards the end of the project, when the prototype for the e-learning program was ready. The reason for involving additional users was to test the user friendliness and relevance of the e-learning program in regard to how well different types of users with different degrees of experience with dysphagia understood the written content, the visual aids, etc. The user input was to a large extent implemented into the e-learning program, thus resulting in adjustments of the learning content or visual layout of the program.

Role of ICT in the collaboration process

ICT did not play a major role in this partnership and was used at a very basic level. It was mainly used to facilitate communication between participants in the project team when they were not able to meet in person, i.e. through e-mail and file-sharing.

Success factors of the project

The success of this project seems to be primarily driven by the high level of motivation and focus on implementation in the project team. The public representatives and user representatives in the project team were experts in the field of dysphagia and really believed that the e-learning program would be a game changer and that it was necessary in order to improve health professionals' competencies. Because of this expertise, the development of the solution was very much user-driven to ensure that it would be beneficial for users. This motivation meant that the participants were quite dedicated to the project and to ensuring successful implementation in order to really make a difference. Moreover, the private business that participated was at that point leading in e-learning in healthcare and had a background in public healthcare. Hence, they were able to speak the same language as the public and user representatives in the project team, paving the way for a more fruitful collaboration.

3.1.2. Patient Reported Outcome Measures in a mobile application (Denmark)

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Introduction of the project

The purpose of the Patient Reported Outcome Measures in a mobile application (henceforth "PROM") has been to improve patient-hospital communication through the development and test of a mobile application that makes it possible for patients to report their progress after surgery from home and for the clinical staff to gain a quick overview of the patients' condition. The project took place at Odense University Hospital (OUH) in four different departments (e-Patient, 2016).

The motivation for initiating this project was, among others, to make it possible for patients to avoid spending time on visiting the hospital several times after surgery to answer routine questions from a doctor if they were doing well. It was also motivated by the prospect of providing a better working procedure within and across hospital departments, as the clinical staff can gain an overview of patient responses and use the responses to plan their work. Moreover, through this project, the hospital could introduce the same solution through one single business rather than using different solutions in each department.

The result was a mobile application that was integrated with an existing, digital patient platform for patient journals at OUH. Patients can answer surveys about their well-being and side effects through the app 3, 6 and 12 months after surgery, and their answers are then scored into one of three categories through an algorithm: red, yellow and green. Patients scoring red and yellow have follow-up meetings in person or over the phone/video with nurses. Green indicates that the patients are doing fine (or as expected) after surgery and the clinical staff do not have to take further action unless the patients specifically request it.

The project was initiated in Spring/Summer 2016 and was completed in early 2017.[10] It was a relatively short project that began with idea development, pilot testing of the prototype and

[10] The time of initiation was according to the coordinator in the Summer of 2016, whereas online information indicate that it started in April that year (http://e-patient.eu/prom/pilot-prom-app/).

implementation. During the first phase of idea development, there were start-up meetings and workshops, where representatives from the departments could express their needs, experiences and ideas/requests for questions, based on which the business started developing the app. The business would then show their progress and collect feedback about the app, as it progressed, including sessions where the departments could try creating the questionnaires themselves in the app with help from the business. During the test phase, patients were enrolled in the system or transferred from the previous system that some departments were using and changes were still made at this point, for instance in regard to how the algorithm in the app categorized the patients (see more in the section on user involvement).

Based on the objectives and phases, the nature of the project was more oriented towards adjusting working procedures rather than exploring something entirely new. The innovation process took place within a relatively short period, and the process was relatively structured. There was a significant focus on quickly getting to the implementation stage, among other things because there was an upcoming regional tender for this type of solution, which the business and coordinator wanted to have the application ready for.

The eHealth innovation

The innovation generated in this project, has successfully transferred patient reported outcome measures from other electronic systems or from paper questionnaires to a mobile application that is integrated with an existing patient platform. However, the app is fully implemented into clinical practice in only one department (Urology) at the involved hospital. The app was purchased and made accessible for other hospitals in that particular region through a common electronic platform, but the researcher does not know whether it is used in practice at other hospitals. The research-oriented nurse that was involved in the project noted that one of the reasons why this type of app is not used more generally is that there is not much evidence of the effect on clinical practice (i.e. whether the information is used actively to improve patient care). Based on the generally positive statements about the use of the app and patient satisfaction from some of the respondents, the app has addressed the objectives from the project in improving the communication between patients and the clinical

staff, but so far, only for patients recovering from prostate cancer surgery in the Urology department.

The app makes it possible for patients to answer standardized questions about their well-being and side effects after surgery. They have to answer the questions 3, 6 and 12 months after surgery to track their progress, which meant that before the app the patients had to come all the way to the hospital from different parts of the region for every check-up, even if they were doing fine. Moreover, physicians had to spend time on these routine check-ups, which is now no longer necessary. Instead, the app scores the patients' answers into red, yellow or green categories that signal to the nurses whether they need to follow up with the patients or not and how (e.g. do they need to schedule a new surgery).

These functionalities imply that patients can access their health information, that personal data about the patients is stored in the app and communicated among health professionals and that the information is used to provide more precise healthcare based on the needs of the patient. From the perspective of the researcher and the project coordinator, this is not a radical innovation but rather an adjustment of work procedures.

Partnership structure, governance and resources

The project was a part of an umbrella project called e-Patient, which was funded by the European Union. The objective of e-Patient was to explore the use of digital solutions in healthcare, especially in regard to improving communication with patients and providing patients with a better overview of the course of their illness. There was a formal steering committee in e-Patient and a project team and coordinator for Prom in App specifically.

The steering committee in e-Patient consisted of two business representatives, the overall project coordinator and the head of innovation at OUH overseeing all projects. The overall project coordinator was also the coordinator for each project within e-Patient, including the project team in PROM in App. She was and is a project leader and innovation consultant at the hospital's innovation unit. There was a different project leader for e-Patient at the beginning of the project, which was the person whom had applied for the project to begin with.

However, she left early on in the project. The project team consisted of a private partner (the business Medware) as well as users and public partner representatives from the four participating departments at OUH: Jaw surgery, the Emergency department, Urology and Oncology. Involved users were mostly nurses (with different types of responsibility, cf. section on users).

The core actors were nurses from Urology and Oncology in the project team, whereas the other departments were less involved. The core actors in the project team provided human resources, which constituted the most important resource in the project, as they contributed with technological knowledge and knowhow (the business) and professional experience and knowledge (the users/public partner), for instance about working procedures and relevant patient questions from the different departments. It was these complementary resources that made the involved actors necessary for the project.

The coordinator contributed with process resources by facilitating and coordinating communication and meetings among the partners and users and taking care of the administrative part of the project (e.g. reporting hours to the EU). She and the hospital also represented the financial resources through funding from the EU, which the coordinator kept track of and the hospital paid out to the business for the hours they put in.

The motivation to participate for the user representatives was, to begin with at least, that they were appointed by their management to participate in the project. They were appointed either because they could be spared for some hours in the daily work at the hospital to participate in meetings or because they had experience with a similar app and/or the development of the PROM questionnaires. Several of them made it clear that it was a hospital management decision to develop and implement this app, but most of them nonetheless were or became motivated, because they considered the solution a way to improve the communication and post-surgery procedure for both patients and staff.

The network governance of the partnership can be characterized as a lead organisation resembling a network administrative organisation (Provan and Kenis, 2008). The coordinator

was a part of the participating hospital's innovation unit, was very familiar with the different departments, characterized herself as also being a public partner in the project, and she was in charge of the administration and facilitation of the partnership. She thus had the role of a centralized broker without representing a completely external organisation. A centralized broker has ties to most individuals in the partnership and is, because of this interconnectivity, able to facilitate interaction (e.g. communication) between actors, even when some actors are themselves not connected directly with each other.

Network management

The coordinator emphasized that the project was overall very smooth without any major conflicts and all needed resources in terms of knowledge and information were present in the project. Based on the interviews, the researcher finds that the only network complexities were that two of the participating departments were less committed to the project, which meant that it was mainly the departments of Urology and Oncology that provided input. Some of the actors also displayed strategic behaviour during the project.

In regard to strategic behaviour, the business had an interest in developing a solution that could be used by other public organisations. Hence, sometimes they would not implement suggestions for patient questions and functionalities from the users, if they were too specific and customized for a particular department. However, as the business had a lot of experience working with people in healthcare, they were good at communicating with the hospital representatives, prioritizing the needs of patients and staff, so it never resulted into conflict. Among the involved users and public partners, there was some disagreement about the type of questions to include in the app. Some of the more research-oriented nurses wanted to only use standardized questions, whereas others requested and developed more customized questions to better enable them to follow up with the patients. This caused some tensions in the project. However, the tensions were solved by focusing on the common goals of both groups of users by implementing questions that could be used across departments and patient groups.

The network management is best characterized by a connecting strategy (Klijn et al., 2010); the coordinator focused on team building, creating incentives for cooperation by making it as easy for the participants as possible and by deactivation of those actors that were not fully committed (two of the departments) to ensure progress within a limited time frame.

Dynamics and activities in the innovation process

The innovation and collaborative process began with the consultation of the involved staff in the different departments of the hospital to find out what their needs were. This resulted in a back and forth dialogue with the business, the coordinator and the users concerning the business' proposed solution. The idea generation thus took part through interaction between the involved parties. However, as it had been determined from the beginning that an app for electronic distribution and collection of survey answers was to be developed, the idea development took place with this particular innovative goal in mind and was therefore somewhat restricted. Moreover, the short duration of the project meant that some of the involved users and public partner did not think there was enough time to overcome cultural differences (e.g. have the business observe their clinical practice) and to test the solution properly before implementation.

The process was generally perceived as open-minded, meaning that the involved users and partners were open to the ideas of others and there was a positive atmosphere in the project team. The public partner experienced that some users were to some degree trying to push their own ideas through. This tension was reduced by refocusing the attention of the users on the common objective of developing a useful app with validated questions that would provide better communication with the patients and a better workflow for the staff. Because of this common objective and the management decision to implement the app, there was a lot of focus on quickly developing an application that was ready for use.

Strategies to achieve societal support for the innovation

Societal support was not a critical focus in the project, because it was a relatively narrow partnership focused on this particular hospital, where it had already been decided to

implement the app. Hence, there was no political awareness or media attention worth noting. The coordinator mentioned however that the Danish Business Authority at one point showed an interest in the project as well as the sectional managers at the hospital, who were not involved in the project.

User involvement

Although the users for the app include patients (it is the patient who answer the questions in the app), this user group was not included in the project. The focus was on involving especially nurses from the four participating departments at the hospital. The interviewed users included a research-oriented nurse who was doing a postdoctoral project related to the solution of the partnership, a development-oriented nurse, a head nurse and nurses working in clinical practice from Urology and Oncology. They had the professional knowledge in regard to which questions should be asked to their respective patient groups and they were the ones to follow-up on the answers, implying that it would be their work procedures that would change because of the app.

With the app, the nurses can look at whether the patients are categorized as red, yellow or green and decide on that basis whether the patients need to consult a physician and come in for a visit or if they are in need of a phone call about their well-being. This was previously the physicians' task, which meant that patients would come in for routine check-ups at the hospital three times after surgery.

The transfer of tasks was an important incentive for the nurses to be involved in the project. For example, in the urology department's first version of the app, the type of questions asked and the sensitivity of the algorithm that scored the patient answers into red, yellow and green meant that almost all patients would receive a red colour, thus requiring a follow-up. The nurses could see that this was because normal side effects were scored as problematic for no reason. They therefore asked the business to adjust the questions to distinguish more clearly between patients that have normal side effects versus worrying side effects and added a

question at the end, where the patient could state whether they wished to have a follow-up conversation.

Overall, from the researcher's perspective, the user involvement was successful. However, it was a demotivating factor that it was a management decision to develop and implement the app, replacing systems that some of the departments were already content using. Moreover, two of the departments became somewhat disengaged throughout the project as they were not particularly interested in implementing the app. Finally, the involved users were not necessarily the most relevant users that could be involved. For instance, a development nurse from urology was appointed to participate in the project, because she had the hours for it, but she did not feel able to contribute because she did not have daily contact with the patients and thus knew very little about the relevance of the questions for the app. On the positive side, the coordinator did a good job facilitating the process, which meant that the users did not have to take care of administration or setting up meetings. The users just had to show up to the meetings, making it easier for them to participate. Some of the involved users were also highly competent and relevant due to their experience with similar systems and their research-based knowledge.

Role of ICT in the collaboration process

ICT was not an important part of the collaborative process of the partnership. ICT was used at a very basic level (email) to facilitate communication among the partners. The focus was on ICT in the end solution. Moreover, the business was local and thus able to visit the hospital whenever needed, which meant that most of the communication and interaction took place in person, thereby reducing the need for ICT in the collaborative process.

Success factors

From the researcher's perspective, the project is a mixed success which resulted in a limited implementation of the developed app and which generated both positive and negative feedback from the users. As such, there were some diverging opinions about the innovation and collaborative process among the respondents. The coordinator and some of the users

generally assessed it as successful and were quite positive. Others expressed frustration in regard to the different perspectives on what the app should have been able to do (i.e. the tension between using the information from the app for research purposes versus more practical, daily purposes). Put differently, a tension existed between using validated, standardized questions or more customized questions developed by each department. Hence, this was less a question of the potential in the technology itself.

Moreover, the public partner and some of the users emphasized how the app was a management decision and that they had not been asked whether it was a good idea. The project was perceived by them as motivated by an economic rationale. The hospital did not want to spend money on licenses for the various solutions the departments were using before, when they could instead pay just one license for a solution that could furthermore integrate with the existing electronic patient platform. In relation to this issue, some of the respondents experienced the project as being rushed, and they wished that they would have had more time to develop and test the solution.

These issues demonstrate the importance of including or consulting users in deciding the innovative purpose of the project to ensure support and a smooth collaboration and implementation process. The relative success of the project can to some extent be ascribed to the coordinator and the business. The coordinator was praised for doing a good job, making it easy and manageable for everyone to participate, and the business for their communication with the involved users, prioritizing their needs as well as the patients'.

3.1.3. MijnGezondheid (Belgium)

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Introduction of the project

MijnGezondheid is a partnership between more than twenty public and private actors, who implemented a portal website, with which a citizen would be able to access his/her medical

information more efficiently. The portal website is connected with different other databases to redirect the user (via single-sign-on) to the right database, without the need for exchange of the data itself.

The creation of a Personal Health system (such as MijnGezondheid) on which citizens can consult most of their patient information was a major objective of the 2013-2018 eHealth policy plan (eHealth Roadmap) of the Belgian federal government. In past years, patient information had become more and more digitalized by local initiatives of regional governments, hospitals and other health care providers. This caused the medical information of citizens to be fragmented in diverse information systems. The federal government proposed to tie-up these diverse information channels so the citizen could have access to all or most of his medical information using only one system. The initial proposal of the federal government was oriented towards the creation of a Personal Health Record. This would centralize the patient information in one system. The Personal Health Record would be able to retrieve the health information of citizens from the different databases when called upon by the citizen. This idea was proposed in 2015 (i.e. start of the ideation phase of the project). Because of the fragmented eHealth landscape at that moment and the many autonomous organisations that were involved in health care provisioning, the federal government decided to initiate a network to work out this idea and manage the various stages of the process.

Reflecting upon the project and the process of innovation creation, we can make a difference between processes that are highly explorative (exploring new ideas, highly flexible innovation process, trial-and-error/experimentation, creative discovery) or highly exploitative (refinement of existing solutions, highly structured innovation process, timely implementation/rigid deadlines). MijnGezondheid is more nuanced, because it contains characteristics of both exploration and exploitation. Although the idea of the Personal Health Record was already coined before the project started (which might point to an exploitative process), the direction of the process changed drastically in 2017 with the proposal of a Personal Health Viewer, instead of the Personal Health Record. This change of direction was necessary to prevent an impasse in the process (later more), but also shows the pragmatic

and flexible nature of the innovation process. There are examples of a trial-and-error signature of the project (e.g. the testing and re-testing of the first version of the website), but overall, once the decision to focus on a Personal Health Viewer was made, the coordinators did their best to carry out the project as efficiently as possible (even sometimes pushing through some decisions). This left little room for exploring alternative courses of action. Furthermore, the delay in the project (because of the initial focus on a Personal Health Record) made a longer ideation phase inopportune because of the mounting pressure to deliver results. This caused some of the actors that were not yet ready to implement the Personal Health Viewer to drop out of the implementation at that phase of the process. These organisations therefore implemented the Personal Health Viewer later than the official release date.

The eHealth innovation

MijnGezondheid is a portal website for patient information. It provides a central portal where citizens can access their medical information more efficiently. The data itself is not stored in MijnGezondheid (it is not a database of patient information). There is also no data transfer between the databases and MijnGezondheid. MijnGezondheid is a central portal that uses single-sign-on to communicate with other servers where patient information is stored. The citizens using MijnGezondheid are directed to these other servers, without needing to login on all of these servers separately. ITSME, a federal encryption tool that uses double authentication, is incorporated into MijnGezondheid. When a citizen logs in with ITSME (or eID or a security code) on MijnGezondheid, he sees an overview of the medical information he can access in a tile structure for optimal visibility. When a citizen clicks on one of the tiles, he is directed to the server where his information is stored, without the need for another login on this server. Doing so, the citizen can consult all of his medical information that is already digitalized and connected to MijnGezondheid through the portal website, without needing to know on which platform/website the information is stored. This makes the access of medical information a lot more efficient. Because the patient information of citizens is fragmented and not all the organisations responsible for this information were able to connect with the portal

website at the time of the release, MijnGezondheid receives new releases every few months, evolving into an encompassing portal website.

As we have mentioned, the breakthrough in the innovation process of MijnGezondheid was a change in the orientation of the project. Instead of trying to implement an ambitious Personal Health Record, the partnership changed course and began to tackle the problem in a more pragmatic way. This pragmatic option resulted in a fairly quick first release of the website. Therefore, the change in orientation was important for the end result of the project. However, the more pragmatic a solution, the less innovative it might be. To evaluate the innovativeness of the end result, we first need to know which eHealth components are used in the innovation. We see that MijnGezondheid tries to increase the health and well-being of citizens by keeping them informed about their health dossier using connected and easily accessible information channels. This allows the users to better control their own health and makes the collection, storage and communication of users' personal information more transparent and efficient. Since the portal website makes an easier access to most of the digitalized patient information possible, citizens might be more proactive in their health care and consult their health records regularly. This could potentially enhance the quality of interaction between patient and health professional. Furthermore, because a large proportion of the digitalised health information of the user becomes more easily accessible for the user, this might allow for a better follow-up of the patient when multiple health professionals are involved. This would therefore stimulate the interprofessional collaboration between health professionals. Regarding the latter, the user remains the broker between the health professionals. If the user is not proactive, interprofessional interaction will not be stimulated. MijnGezondheid does not enhance the accessibility of information between health professionals, only between health professionals and citizens/patients.

To evaluate these components even further, we looked at the functionalities and technologies, and especially at their newness and importance. Essentially, MijnGezondheid did not create new infrastructure that can be used by citizens (new networks, new data platforms, …). It uses the available infrastructure of the hospital hubs and information vaults

and reconnects them. Therefore, citizens who know their way around the eHealth landscape, would have been able to access all of their digitalized health information, regardless of MijnGezondheid. In other words, the functionalities of MijnGezondheid are perfectly accessible through alternative platforms of the individual health providers. However, users would never have been able to access their health information as efficiently without using MijnGezondheid. MijnGezondheid makes it a lot easier to efficiently consult health information because of the redirection mechanism of the portal website. Just as the home page of any website has hyperlinks to the diverse subsections of the website, making easy navigation on the website possible, MijnGezondheid has hyperlinks that directs the user to different pages where their information is stored, regardless of which server is storing this information. Therefore, the innovativeness of MijnGezondheid is not in its complexity, but in its simplicity.

Using a pragmatic approach, this innovation is also less impacted by technological complexities, which increases the likelihood of thorough implementation and actual use. Because being informed about one's health is an essential aspect of every citizen's life, and since MijnGezondheid is accessible for every Belgian citizen, the potential impact of this innovation could be enormous. Although technology is an essential part of this innovation, the used technologies themselves are not highly innovative. Portal websites and single-sign-on protocols are fairly common and the access to the various databases where the actual health information is stored, is controlled by the eHealth platform (metahub). This technology has been used for more than a decade. The only new technology that was incorporated for the first time in this implementation was ITSME, an alternative for the use of eID cards. ITSME uses an app to give users access to their health information. Overall, the pragmatic approach of the project succeeded at implementing a working system in a relatively short period of time, and which tackled the problem of fragmented health information of citizens successfully and laid the groundwork for future endeavours to easily incorporate even more digitalized health information. If we perceive an innovation as both new and impactful, we can argue that the

pragmatic approach made the innovation less new, but more impactful because of its simplicity in use and adaptability over time.

Partnership structure, governance and resources

The network was composed of important governmental and health care actors, complemented with representatives of patient organisations. Because of the complexity of the already established eHealth landscape, regional differences and a lack of political momentum, the partners had difficulties to achieve progress in working out the Personal Health Record. Especially the objective to give a centralized overview of all of the patient's information was a problem for which there was not an easy solution. To prevent a complete blockage of the project, the partners left the idea of the Personal Health Record and started working on a Personal Health Viewer. The Personal Health Viewer would allow a citizen to access all of his information, without needing an information exchange between the diverse organisations. The Personal Health Viewer is a portal website that works with a single-sign-on that redirects the citizen to the proper database where he can then access his information (more on this in the section on the eHealth innovation). The partners started to work out this idea in 2017 and at the start of 2018 there was a test version. In the test phase, specific partners (e.g. PraktijkCoach, VPP (Flemish patient platform), etc.) tested the portal website and made suggestions for improvement. In May 2018, the first version of the Personal Health Viewer was released on the website *mijngezondheid.belgie.be*. Since then, several new versions have been released.

The partners were involved in the project through a clear governance structure. There were three project bodies, namely the steering committee, the project group and the core team. The steering committee was composed of governmental actors (RIZIV, the Federal Public Service for Public Health, the e-Health platform, FAGG, the cabinet of the Minister of Health, and the program manager for eHealth) and was the leading body of the project. The core team was composed of representatives of user/patient organisations (VPP, LUSS) and the coordinators of the project (Federal Public Service for Public Health, cabinet of Minister of Health), and had an important role for the translation of user expectations. The project group

was composed of several actors from the health landscape, including the hospital hubs[11] (COZO, VZN KU Leuven, Abrumet and RSW), the college of health insurance organisations (NIC-IMA), the Flemish eHealth vault (Vitalink) and several other important actors in the health landscape (Red Cross Belgium/Flanders, Recip-e, Intermut, Gezondheid & Wetenschap, etc.).

All of the actors had important reasons to participate in the partnership. The governmental actors were responsible for the eHealth policy and service delivery for the Belgian citizens and also invested the financial resources in this project. The hospital hubs were crucial because a lot of patient information was already connected with each other through these hubs. The hubs wanted to ensure that their way of working would not be jeopardized by the plans of the federal government. The hospital hubs also wanted to make patient information easier accessible for citizens. The representatives of patient organisations and the health insurance organisations health insurance organisations participated to clearly communicate and translate the expectations of the citizens in the project. Each of the other actors in the partnership also had specific reasons for being involved, either because they had important patient information which would be made easily accessible through the Personal Health Viewer or because of knowledge or resources they could invest in the project, pursuing private interests (e.g. companies such as HealthConnect, Recip-e, PraktijkCoach). All of the actors were however acting together to implement policy that was directed from the governmental institutions. The most important institutions were the Federal Public Service for Public Health and the cabinet of the Minister of Public Health. These institutions also provided the coordinators of the partnership. Because the project was mainly a government project, these actors had a strong mandate and authority in the partnership. A lot of characteristics of the network therefore correspond with the description of the lead organisation governed network (Provan and Kenis 2008). The coordinators of the project were responsible for coordinating key decisions, managing activities (e.g. meetings) and giving direction to the project.

[11] A hospital hub is a digital network of hospitals which connect the patient information from those hospitals. There are two Flemish hospital hubs (COZO and VZN KU Leuven), one hospital hub for Wallonia (RSW) and one for Brussels (Abrumet).

Network management

As already mentioned, the change in focus from Personal Health Record to Personal Health Viewer prevented the project to became trapped in an impasse. A lot of differences in opinions and conflicting interests were the origin of the change in focus from a Personal Health Record to a Personal Health Viewer. Although the Personal Health Viewer was already proposed in 2015, the federal government and the representatives of the patient organisations preferred a system that was more thorough. They wanted an efficient system through which citizens could directly consult their information. Some of the regions and hospital hubs were however very reluctant towards these ideas as they feared that another system would replace their own hospital hubs, which had been working fine for almost a decade. Moreover, the health insurance organisations and Flemish government had invested a lot in building their own Health Viewer, which made a centralized access of some of the health information for Flanders possible. These actors were not eager to invest additionally in a system which would work in parallel of theirs. As a consequence, there was a lot of miscommunication and a lack of trust between the partners in the phases before 2017. This was still visible in the first discussions about the Personal Health Viewer. The coordinators (from 2017 onwards), spent a lot of time to align the various opinions and views from the actors, but could only do this to a certain extend. After all, the focus of the project had shifted from a Personal Health Record to a Personal Health Viewer and this had consequences for what the system would be able to do and how it would operate.

For example, since the priorities of the health insurance organisations revolved around their own Health Viewer, they were not ready to implement a single sign-on to connect their information with the Personal Health Viewer. This caused a lot of discussions concerning the deadlines of implementation. Eventually, the coordinators took the position that they would release the website on time but would make it possible for some organisations to connect to the website at a later time. In short, a combination of a delay in the progress, an initial lack of trust between the partners caused by earlier conflicts and detrimental encounters, conflicting priorities, protection of own interests and practices, organisation specific procedures ("we

first need to check this") and differences in technical readiness created a complex environment the partnership had to manage to be able to achieve the required results.

Because of the various differences in opinions and a lack of general support for the Personal Health Viewer in the first stages of the process (from 2017 onwards), the partners and especially the coordinators had to maintain a delicate balance between those actors who were willing to take big steps in the implementation of the Personal Health Viewer (and who wanted to do even more), and those actors who were not yet convinced that there was a need for a Personal Health Viewer or were not yet ready to implement it. The coordinators tried to bring these groups together at the same meetings, so they were confronted with each other's viewpoints. The governance structure was the driving force behind this strategy. There were a lot of cautious discussions between the partners in which the coordinators and partners tried to "swim around precarious problems" and focussed on what the partners united instead of what divided them. Although the large group of stakeholders involved in the project generated a lot of complexities, the diversity in orientation and fields made it possible to explore more knowledge and test if some ideas would be supported. Each of the partners had their own member base, who could be asked for feedback on particular problems. This legitimized the positions the partners took in discussions.

Open and careful discussions were only possible when discussants spoke the same (technical) language. The coordinators acted as brokers between different groups of people (e.g. ICT-minded vs. non-ICT-minded people). If we consider the network management strategies of Klijn et al. (2010), there was a clear focus on connecting strategies because of the specific context in which the project evolved (both external, e.g. eHealth landscape, governments, …, and internal, e.g. conflicts and distrust between partners). Given the number of stakeholders involved in the project, the exploring strategy was also crucial. However, as stated before, the exploration was limited as the direction of the project was already decided. The exploring strategy was also used to explore the legitimacy of particular decisions (e.g. "will citizens find this useful?"). A clear example of the arranging strategy was the introduction of the governance structure, which was helpful in capturing diverse viewpoints and solving conflicts.

Process agreements were used less than the other strategies, except for the eHealth Road Map which was of prior importance to connect all the eHealth initiatives of the federal government (of which MijnGezondheid was one) and to relate them to one another. It however did not specify how the collaboration processes would be organized.

Dynamics and activities in the innovation process

The idea generation in MijnGezondheid was ambiguous. Because of the strong influence of the Federal Public Service for Public Health and the cabinet of the Minister of Health, combined with the policy directions in the eHealth Road Map, some of the general ideas already existed before the start of the project. However, these general ideas changed quite fundamentally with the transition from Personal Health Record to Personal Health Viewer. This points to a learning curve in the process. As mentioned, the complexities in the partnership impeded the idea of a Personal Health Record to come to fruition. Through active interaction (dialogue, discussion, deliberation, persuasion, …) between the actors in the partnership, the idea for a central portal for health information (i.e. Personal Health Viewer) received more and more support in the partnership. As mentioned, the idea of a Personal Health Viewer was initially proposed at the very start of the project in 2015 but was abandoned later on in the process. It was only when the project stagnated and the new coordinators (from the Federal Public Service for Public Health and the cabinet of the Minister of Public Health) became involved in the project that this idea was reconsidered. In other words, the idea for a central portal did not emerge because of the interactions between the individuals. It was brought up by specific actors in the project at specific points in time. The actors in favour of this idea interacted with each other in search for consensus, not to generate the idea itself. For example, some of the partners in the project had experience with using similar systems to access information stored in different places and could use this experience to convince other partners. However, many additions to the general idea of the central portal were added because of deliberation between the partners. Examples of these new ideas were the visualisation of the website using tiles which correspond to specific health services, the framing of the information on the portal website so it would be understandable for citizens,

the use of ITSME as an authentication tool for citizens, etc. In other words, at the general level of the idea (central portal website), interactions between the partners were directed towards finding consensus between the partners for the idea. At the specific level of the idea, interactions between individuals were directed towards producing new ideas which could be added to the general idea of the central portal website.

If we delve deeper into the interactions that caused either the consensus building for a central portal website or the idea generation for specific components of the central portal website, we see that the dynamics of these interactions were not always highly collaborative. The advantage of working in the health sector was that every partner wanted to create services of high quality for a similar group of stakeholders (patients, health care professionals, citizens, etc.). However, the desired mechanisms to come to these high-quality services differed from partner to partner. Some of the partners wanted to reengineer the current information exchange between patient and health care providers because they considered it inadequate, while other partners were perfectly fine with how the information exchange currently happened. Not all of the partners were in favour of changing the underlying processes and systems of the information exchange. Moreover, some of the partners were fishing in a similar pool of clients, had similar interests, or were dependent on similar resources. This elevated the competition between these partners. However, all of the partners were interdependent of each other, which means that they could only produce a desirable outcome if they worked together. This balance between competition and interdependence created strategic opportunities for the involved partners. When some of the partners were not willing to invest in particular components of the innovation, other partners who were willing to invest had a competitive advantage over them. Since these partners were dependent on the commitment of the other partners to produce a desired outcome, they did not exploit their competitive advantage too much to prevent pushing the other partners out of the partnership. At the same time, the partners were thus incentivized to raise their commitment in order to increase their own competitive advantage. The coordinators exploited this balance between competition and interdependence by pointing it out to the partners. One of the coordinators stated: “If the

standard is the fast group, the slow group will drop out. If the standard is the slow group, the fast group will start to make their own applications. We wanted to include everyone, but for that, the fast group had to be pragmatic and the slow group had to commit themselves to improve." A strategy of external communication to users and politicians helped to enforce this balance on the partners: "We used a name or shame approach. If the slow group did not commit themselves, it would be pointed out ("they are not ready"), while the other partners would be lauded. If they committed themselves, they would be praised as well".

Strategies to achieve societal support for the innovation

Since MijnGezondheid was part of the deliverables of the eHealth Road Map, societal support was extremely important in this project, especially from the relevant elected politicians who created legitimacy for the project. Support from them was crucial for the success of the project and was also achieved, both at the start of the project and throughout the project. The support of the politicians increased somewhat at the end of the project when the actual results of the project were starting to become visible.

The coordinators also launched initiatives to communicate the eHealth Road Map and MijnGezondheid to local politicians who were closer to the citizens who would actually use the MijnGezondheid website. Together with other partners, the coordinators created educative movie clips to explain what MijnGezondheid would entail and how citizens could use it. Since most of the relevant actors in the eHealth landscape were already involved in one of the project groups of the partnership, few other actors in the broader health sector were needed to ensure societal support for the project and the innovation. At the start of the project, most of these actors were not aware of the project. Throughout the project, communication initiatives from the cabinet of the Minister of Health ensured that all the relevant health actors were notified about the project. This helped to stimulate the support for the project. This support was further stimulated through media interventions. In this sense, the media was an important external actor to keep various stakeholders notified about the project. As with the other actors, the media attention increased throughout the project because the results became more and more visible. The coordinators also held a press

campaign when MijnGezondheid was launched and communicated through press statements each time a new version of the website became available. Therefore, the media can be considered as an important external actor to achieve societal support for the project as well.

User involvement

As mentioned, there were a lot of user organisations involved in the project. Some of these user organisations (VPP and LUSS, both representatives of patient organisations) were part of the governance structure of the partnership and fulfilled important roles (for instance the role of chair of some of the project groups). VPP and LUSS are umbrella organisations of the Flemish and Walloon patient organisations. This gave them an important role in directing the project towards the demands of the patients. Although these two actors were at the centre of the partnership, other user organisations were involved as well throughout and after the project. Examples are Domus Medica (interest group of physicians), SeniorNet (interest group of elderly people), and several other actors who had experience with the impact of such innovations on patients/citizens (e.g. PraktijkCoach, HealthConnect, Wit-Gele Kruis, etc.). Some of these actors (for example SeniorNet) were involved mostly after the project to communicate the website to specific user groups, while other actors (for example Domus Medica) were already present in the project groups from the very beginning (2015). Other actors (for example PraktijkCoach) were primarily involved in testing and improving the website and communicating it to the media. Therefore, the roles user representatives took on varied.

The majority of user activities revolved around being informed, being consulted, and advising the partnership about specific issues. Examples of the latter include the advice representatives of Domus Medica formulated about the importance of patient rights and privacy (after which the partnership sought legal advice), technicalities surrounding medication schemes, and the need for user friendliness of the website. Regarding the latter, both VPP and LUSS generated important input in the way the content of the website would need to be formulated. Their involvement was however more than just advising the partnership. Because of their solid position at the core of the partnership, VPP and LUSS were involved in many of the decisions that were made by the partners. They also formulated a note that would be used to evaluate

the outcome of the project in function of the user demands. Therefore, the involvement of users in MijnGezondheid should be thought of as a spectrum on which various actors had their own responsibilities. Table 4 illustrates this.

Table 4: Participation of users in MijnGezondheid

Being informed	Being consulted	Communicate/ disseminate	Advise	Test and evaluate	Co-produce
All of the involved users	All of the involved users	SeniorNet, VPP/LUSS, PraktijkCoach	Domus Medica, VPP/LUSS, Wit-Gele Kruis, etc.	VPP/LUSS, HealthConnect, PraktijkCoach	VPP/LUSS

Most of the involved users were representative of particular user groups (e.g. physicians, chronic patients, elderly people, users of similar online tools, etc.). This created an interesting combination of knowledge and experiences, but the involvement of these representatives also ensured support from a broad spectrum of users. Both these incentives stimulated the users' willingness to become involved in the project and were also the main arguments for the extensive participation of the partners with these users. The open communication between users and partners, the incorporation of some of the users in the governance structure of the partnership and the strong position each of the user organisations had in their own field of expertise ensured that the user involvement was a success.

Role of ICT in the collaboration process

As mentioned, MijnGezondheid directs users to the proper database using a single-sign-on. This is possible because most of the patient information of the citizens is already digitalized by the health care providers or governments in so-called information "vaults" and in many cases this information is also distributed between various health care providers using the digital networks of the hospital hubs and the meta hub (the eHealth infrastructure of the federal government). As such, MijnGezondheid is able to redirect the user to the database in which his/her information is stored. Because of this highly digitalized context, ICT was crucial for the success of the project. The partners had to take into account the technological connections and storage vaults that were already present in the Belgian eHealth infrastructure and how the project would benefit from this available eHealth infrastructure. Therefore, the

available digital networks between the various health care providers and the vaults of the care providers and governments were important elements for the partners to implement the portal website. Without this infrastructure, MijnGezondheid as we know it now would not have been possible.

ICT was not only crucial for the technical realization of MijnGezondheid but was also used in the process of collaboration. Because of the complexity of the partnership (a lot of partners from a variety of fields), the coordinators used virtual teams to enhance the collaboration between the partners. Also, to test the functionalities of the website, the partnership worked together with PraktijkCoach to develop a testing environment in which users could use the website and give suggestions for improvements. Furthermore, the short instruction videos that were sent to local politicians, and others, to advise the users about MijnGezondheid and how to use it, were created in cooperation with a media company (MediaHaven). These videos were essential for the support of local politicians for the website.

Success factors

It is important to understand the complexity of the health sector in Belgium. Health is responsible for almost one third of the federal budget and is fragmented over federal, regional and local levels. As a consequence, health information is stored on public/private local, regional or federal servers, each with their own competences regarding this information. Furthermore, each level/organisation has its own approach of storing information, which leads to a complex network of different local servers. This entails not only the information of hospitals, but also of GPs, home care organisations, physiotherapists, nursing homes, health insurance organisations, etc., many of which are private organisations. Several local initiatives have already tackled the increasing fragmentation of information, with examples such as the hospital hubs (COZO, VZN KU Leuven, RSW, Abrumet), the metahub (eHealth platform) and several data vaults connected to these hubs (through the metahub) (e.g. Vitalink, Brusafe+, Wit-Gele Kruis, etc.). However, there are still different interfaces (websites) with which the citizens can get access to these hubs or vaults. This decreases usability. MijnGezondheid is an answer to this problem.

A combination of several factors was crucial for this innovation process. First of all, almost every stakeholder who could contribute to the project was involved in the innovation process. This not only caused an increase in support for the project, but it also allowed the project to explore the knowledge and resources of these stakeholders. Especially the users were very closely involved in the project. Second, and related to the first factor, the project established and maintained a clear governance structure, which made the role of the various partners clear and stimulated the interactions between the partners. Third, clear dialogue and consensus building behaviour of all of the partners resulted in issues being addressed before they could create huge problems. In general, the amount of energy invested in the interaction between the partners was substantial. Fourth, the arrival of the two new coordinators gave a new dynamic to the process, which was at that time almost in an impasse. The two coordinators explored possibilities, stimulated interaction between the partners and created a way forward by active interventions (e.g. making strategic decisions, bilateral dialogues, stimulating engagement and commitment, etc.). Fifth, the innovation process was flexible. Although there was not always room (or time) for experimentation, the process evolved naturally towards a certain outcome, being pushed and pulled between the different partners and their activities. This allowed the partnership to react quickly to changing circumstances without becoming entrenched in passive behaviour.

3.1.4. MijnWGK (Belgium)

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Introduction of the project

MijnWGK is an online data platform which allows an efficient access of health information of WGK[12] clients for general practitioners (GPs) and the clients themselves. WGK exists of five

[12] WGK stands for Wit-Gele Kruis, which is a private home health care provider and is responsible for approximately one third of the total home health care in Flanders. The health care providers of WGK are predominantly nurses.

provincial non-profits which all have access to patient information. However, before MijnWGK, the GPs who treated the WGK patients had no access to this information. This information might be crucial for the GP to take decisions about the medical conditions of the patient. The WGKs invested in a tool which would allow the GPs to have access to the WGK database without the need to buy a new software tool.

The project started bottom-up with the question of ten physicians in the province of Limburg to use some of the information they had about patients which were also patient of the WGK. The WGK of Limburg experimented with a simple website to see how the interaction between GPs and the WGK could be organized, which information the GPs could share, and which information would be relevant to share with the GPs. This project was a learning trajectory for the other WGKs, and the general necessity of interprofessional interaction between GPs and WGKs was apparent for all WGKs. All WGKs saw the need for such a system and decided to work together. This led to the start of the conceptual phase of the project, in which expectations were formulated and the procurement demands were drafted. What was learned from the experiment in Limburg was used to draw up some of the tender specifications. HealthConnect, a private ICT-developer and ICT-consultant, won the tender procedure and started to create a testing version of the tool together with the WGKs and a couple of physicians who were deeply involved in the whole project.

Because data would become accessible to the GPs through the eHealth metahub [13], the eHealth platform of the federal government quickly became involved in the project. Through single sign-on and connection to the eHealth metahub (eHealth platform), it was possible to give GPs access to the WGK database without having to login again. Furthermore, the WGKs

[13] A hospital hub is a digital network of hospitals which connect the patient information from those hospitals. There are two Flemish hospital hubs (COZO and VZN KU Leuven), one hospital hub for Wallonia (RSW) and one for Brussels (Abrumet). The hubs are all connected to the 'metahub', which is the eHealth platform of the federal government ("eHealth platform" is the official name of the government agency and 'acts' as the metahub of the Belgian eHealth network, i.e., it has the responsibility to connect all the hospital hubs and data vaults). The eHealth platform is able to access eHealth data from the hospital hubs and other data vaults (MijnWGK is an example of such a data vault) and pass it through – by using secured connections and single sign-on – to the various actors in the eHealth network.

made sure that the single sign-on was user-friendly by incorporating it into the electronic medical dossier (EMD, software package the GPs use to manage the medical dossiers of patients) of the GPs.

The first testing of MijnWGK started at the end of 2015, and the front-end testing was conducted in April of 2016. In October 2016, the tool was finalized and released.

Because of the extensive experimentation in the pilot project in the province of Limburg (which initiated the actual MijnWGK project), the MijnWGK project was fairly structured and not much experimentation was required. Because of the procurement procedure, the WGKs already made a detailed overview of their demands. This however does not mean that there were no ideas created and tested once HealthConnect won the tender. There was a frequent back-and-forward between the project manager of HealthConnect and the coordinator of MijnWGK which resulted in changes of the tool throughout the process. Additionally, the involvement of the eHealth platform to connect MijnWGK to the metahub only became possible after active consultation of the eHealth platform.

However, after the contract close with HealthConnect, there was no trial-and-error anymore, and deadlines had to be respected. Due to the structured approach which came with the contract between the WGKs and the procurement procedure, a large amount of thinking went into the project before it actually started, which resulted in less leeway in the innovation process itself. Examples of this are the detailed project plan and the fact that both mandates of participants and the types of used technologies were clear from the beginning. The idea generation phase could therefore be seen as starting from the beginning of the pilot project until the procurement procedure was initiated. Even then, some of the core partners (especially the WGKs and the user representatives) had already consulted each other and had produced a number of expectations for the MijnWGK tool. In other words, the project could afford to be more exploitative in nature because of the pilot project and conceptual phases before the actual start of the project, which were highly explorative.

The eHealth innovation

MijnWGK is a tool that provides access for GPs to patient information of WGK clients. When users are logged in on their EMD, they can be redirected to the WGK servers using a single sign-on provided by the metahub (eHealth platform). The hyperlink that redirects the users to the WGK servers is built into the EMD software itself to increase the user friendliness of the application. This enhances the communication and interaction between the health care providers and also allows for stronger interprofessional collaboration to emerge. Due to this information exchange, GPs and WGK health professionals are able to align their treatments. Furthermore, online information which was previously inaccessible for GPs can now be consulted. These innovations might have a major effect on the health and well-being of patients. The patients themselves can also access this information which gives them more control over their own health. The collection, communication and storage of patient information changes due to the network approach of MijnWGK. Information is not the exclusive property of the WGKs anymore and is an asset for a broad range of health professionals and stakeholders (not only GPs but also physiotherapists and the patients themselves). This information can also be consulted on mobile devices (using an app) which allows for a more efficient access to this information.

To evaluate the innovativeness of these components, we looked at the functionalities and technologies, particularly their newness and importance. The functionalities of the innovation can be considered as very new. There were no applications available at that time which could communicate patient information of the WGKs to the GPs. Even now (after it has been implemented for more than three years), little progress has been made by other home care organisations to build applications with similar functionalities. The usability of the innovation is another criterion which we took into account when evaluating the importance of the functionalities. Because not all patients are part of a home care organisation and those who are, are not always a client of one of the WGKs, the innovation is only useable for a limited number of patients. However, on the user side, every GP who works with patients of one of the WGKs can use MijnWGK. There are also other health professionals who can use MijnWGK

(such as physiotherapists). Still, because GPs can only consult information that has been generated by the health professionals of the WGKs and are unable to insert information themselves, the usability of the application remains rather limited. Real interaction between WGK health professionals and GPs is therefore hindered, which limits the emergence of new possibilities for personalized health care that is tailored to the patient.

At the time of the implementation, the used technologies were quite new. There were not many examples of where a single sign-on provided by the metahub for a private organisation allowed for an indirect connection between two (or more) separated servers. The single sign-on technology allowed the WGKs and GPs to connect the patient information without the necessity of a real connection between their servers. This, however, demanded an authentication by the metahub. Every time a user consults the MijnWGK application, the metahub authenticates the user's request and allows a safe access to the WGK servers. Furthermore, the way in which the hyperlinks, which redirected the users towards MijnWGK, were incorporated in the software of the EMDs was very novel. After all, each GP had his own software supplier who was responsible for creating the EMD, which resulted in various distinct software suppliers who had to incorporate the hyperlinks in their own software.

The single sign-on, authentication and reconfiguration of EMDs were crucial technological components for the success of the project. The approach also triggered a new way of thinking about information exchange between various organisations. Instead of trying to centralize this information in an accessible way for users, this project used a "redirection logic". This meant that none of the information had to be centralized, but users had to be able to access servers of health organisations under the supervision of a central authority (metahub). As such, data did not migrate from one place to another (which required solid network infrastructure, server capacity, harmonized processes and a system to ensure that consulted data was authentic). Instead, users migrated themselves to the places where this information could be consulted. This made the implementation far easier, cheaper and less risky. In other words, more than the innovativeness of the technologies, the idea was innovative and heralded a new way of information exchange between disparate organisations. However, much of the initial ideas

which came out of the pilot project were not implemented in MijnWGK, foremost the ability to organize mutual information exchange between GPs and WGKs. We could therefore argue that the problem has only be partially tackled and that there are still opportunities to enhance the system.

Partnership structure, governance and resources

In addition to the five provincial non-profits, the WGKs also contain one federated non-profit which coordinated the MijnWGK project. All of the five provincial non-profits are however autonomous organisations (including their own board of directors). The federated non-profit was established to tackle issues which exceed the individual non-profits. In such cases, of which MijnWGK is an example, it has to collaborate with the provincial non-profits. Because of the highly autonomous legal nature of the WGKs, a contract was signed between the WGKs to ensure their engagement and commitment in the MijnWGK project. The federated WGK – which would be the coordinator of MijnWGK – worked together with a law office (TimeLex) to prepare this contract.

The eHealth platform registered WGK as a data vault, which would become – upon authentication – accessible for other organisations in the eHealth network. The network of WGKs, HealthConnect, some of the involved GPs and the eHealth platform can – because of their essential role in the realization of MijnWGK – be considered as the core partners of the network. Some of the more peripheral actors in the network were important for their position in the (e)Health landscape. The Flemish hospital hubs (COZO and VZN KU Leuven) were crucial actors in this network, which accounts for their involvement in MijnWGK. Because of the wish of some GPs to make the connection to the WGK database visible in the EMD software of the physicians (and as such increase the user-friendliness of the tool), several software suppliers of GPs were consulted for this implementation. Amaron, a software firm which specialized in eHealth integration was also consulted to consider how such connections might be realized.

Several other actors were informed and consulted about the project. First of all, because the federal government had a long track record in eHealth services and connections, as well as in

specific policy and regulation regarding eHealth, the WGKs informed all of the relevant ministerial cabinets and federal administrations about their ongoing project. Furthermore, the Flemish Patient Platform (VPP; platform for Flemish patient organisation) was consulted about how certain health information of WGK patients could be incorporated in the MijnWGK tool and visualized for physicians and patients.

Because the collaboration was voluntary, each partner had its own reasons for being involved in the project. The provincial WGKs were searching for a solution to the information divide between the WGKs and the GPs, which was also the reason why some of the GPs were deeply involved in the project. These WGKs had to work together under the coordination of the federated WGK, because of the scale of the problem and the investment. HealthConnect is a for-profit company in health technology, which meant that profit was the primary motivation to be involved in the project. Additionally, the project created new opportunities for future jobs and a way to commercialize the knowledge HealthConnect had created in this project. The eHealth platform in turn achieved more legitimization for its metahub functions in the eHealth network by being responsible for the connection of an additional data vault. Other partners were either payed for their services, or had a major role in their respective fields, which, by being involved in this project, legitimized these actors' positions in their fields even more.

The governance structure of the partnership existed of a steering committee and several project teams. In the steering committee, representatives of the board of directors of the federated WGK were present. In addition, there was one user (physician) present in the steering committee, as well as the project manager of HealthConnect and the coordinator of the project. The project teams were managed by the project management of HealthConnect and the project coordinator. There were four project teams, each with a different function (data protection, front-end, back-end, implementation). Because of the strong coordinating role of the federated WGK, and the project structures this WGK developed to manage the innovation process, we consider the partnership as a network-administrative organisation (NAO) (Provan and Kenis 2008). The federated WGK would then be operating as a NAO which

controlled the execution of the project from within the organisation. The project structures are therefore also incorporated in the NAO, a characteristic we also observed in the MijnWGK project.

The five provincial WGKs provided the financial resources for this project. Although the financial, ICT and human resources played fundamental roles in the success of this innovation process, judicial resources were arguably the most important. They established the base for collaboration between the WGKs (contract between the WGKs) and between the WGKs and HealthConnect (tender). Furthermore, without the judicial steps of the core partners, important issues such as the technical realization of informed consent and therapeutic relations, and the authentication and confirmation of the eHealth platform and the Privacy Commission, would not have been easily solved.

Network management

Because all of the WGKs were autonomous but became interdependent because of the partnership, complexities arose during the innovation process. The WGKs had conflicting opinions which needed to be aligned before the innovation process could continue. For example, one of the WGKs had some concerns about sharing its information with other health organisations through the eHealth platform, because they were afraid that other health organisations/physicians would not use their information (supposed lack of return on investment). This caused a delay of four months for the project. The federated WGK, the other WGKs and the eHealth platform tried to convince the doubting WGK through open discussion and dialogue that additional technical measures would not be necessary, because the amount of informed consents was growing every day. Also, related to the previous problem, there were some doubts about some of the technical aspects of informed consent and therapeutic relations. This was one of the reasons why the coordinator involved TimeLex (law firm) and BA (ethical hacking firm) besides HealthConnect. Also, there were some questions during the project about how to connect the MijnWGK database to the eHealth platform (through one of the hospital hubs or as additional data vault). For this, the partnership had to contact COZO and VZN KUL (two hospital hubs) to see what was more beneficial.

The federated WGK and especially the coordinator were responsible for revealing issues and differences in perspectives. For example, there were some differences in approaches between the WGKs as to how the data would be communicated to the central server (through webservices or through direct communication between servers). Moreover, some WGKs were technically not yet ready to implement all of the changes. The coordinator tried to identify which WGKs were ready for some implementations and which were not. Through transparent communication and discussion between the WGKs, the coordinator found common grounds and achieved progress. For example, one partner wanted to work with Vitalink (a Flemish eHealth data vault) for the medication scheme, while the rest wanted to work with their own medication schemes. The matter was resolved by letting the one partner proceed with Vitalink without affecting the whole project. The coordinator could also use the chain of command of the federated WGK to push through some decisions.

Furthermore, there were some differences between the WGK culture of decision making and the culture of decision making at HealthConnect. The WGKs were used to seek consensus between them, because they were all autonomous. This was something HealthConnect was not used to, which became visible in the wish of the federated WGK to open up the software for external parties. Some of the WGKs preferred not to do this and shielded their software from external parties. To prevent more of these issues, the coordinator had drafted a contract between the WGKs together with the lawyers from WGK and TimeLex before the project started. There was an opt-out clause in that contract which stipulated that every WGK could choose to remain part of the project or could search for alternative firms with which they would rather work to implement some of the tools. They could even exit the whole project if they wanted. They would then receive the code of the software to develop it on their own.

Although most strategies employed by the coordinator and other partners focused on the exploring and connecting network management strategies of Klijn et al. (2010), the importance of the process agreements in this project cannot be overstated. The contract already aligned many views and interests of the participating WGKs and reduced the risks, uncertainty and transaction costs in the partnership substantially. Whereas the contract was

the foundation for the interactions between the partners, the exploring and connecting strategies were employed to deal with unpredictable features, such as technical difficulties, new issues or dilemmas or changes in partners' perspectives. The project structure (arranging strategy) facilitated the employment of these exploring and connecting strategies.

Dynamics and activities in the innovation process

As mentioned, the idea generation phase of the innovation process can be identified before the actual start of the process. The pilot project in the province of Limburg created many insights in how to share data with GPs, which resulted in a breeding ground for the MijnWGK project. The initial idea was therefore not produced through interactions between the project partners, but through experiences from the pilot project and the tender criteria formulated by the steering committee and board of directors. There was, however, a lot of idea generation after the contract with HealthConnect was closed, focused on the development and implementation of the innovation. For example, the first conversations between the coordinator and the eHealth platform were about how the therapeutic relations could be incorporated in the connections. These discussions were very technical and aimed at the implementation of MijnWGK, but nevertheless new ideas arose during these discussions (e.g. MijnWGK as an individual data vault or one of the databases of COZO/VZN KUL).

Representatives of the WGKs in the partnership were especially incentivized to report differences of opinions because if these differences were fundamental, they would need to use the opt-out clause. Furthermore, HealthConnect defended its own ideas because of the potential to retain some of the concepts and technologies in future projects or commercialize ideas into new products. As mentioned, the coordinator needed to search actively for consensus and compromise between perspectives which were not already aligned in the contract. However, the contract resulted in an easier identification of differences in perspectives which made it easier for the coordinator to tackle these differences. The contract gave the partners also a larger freedom because of the opt-out clause. After every meeting, the representatives of the WGKs went back to their organisations and decided how feasible certain considerations were for their own organisation. If an implementation was not feasible

at that time, partners shifted the timeline for that implementation. After all, the focus of the WGKs was on making something that they could implement.

Some more innovative ideas that were suggested by HealthConnect were abandoned because some of the WGKs thought these ideas were too far-reaching (they were not technologically ready to implement these innovative ideas). An example of this is the suggestion to include two-way communication between physicians and WGK care providers, which was abandoned because some of the WGKs were not ready for the technical implementation (e.g. new processes had to be introduced). Although the contractual relationship between the WGKs themselves and the WGKs and HealthConnect reduced uncertainty and increased freedom of action for the individual participants, this also had an impact on the interdependence between the partners. Because the interdependence between the partners was formalized in the contracts (e.g. the opt-out clause), it was easier for partners to oppose certain directions of the project, and to decide not to participate in certain implementations. In other words, the contractual relationship caused less interdependence which – for some implementations – caused less commitment to implement the solutions (because they could always opt out).

Strategies to achieve societal support for the innovation

Both the relevant elected politicians and other actors in the broader health sector (but not part of the partnership) were very important to achieve societal support. Since MijnWGK was operating in parallel of the eHealth policy of the federal government, both governmental officials and politicians (in the form of ministerial cabinets) needed to be informed about the objectives and consequences of MijnWGK. Because of the important role of the eHealth platform in the partnership and the opportunities MijnWGK offered for the eHealth network (a new data source which enlarged the eHealth network), the project became well-supported by these stakeholders. The partners in the project organized activities to ensure this support (e.g. communication and sending a demo to ministerial cabinets).

Whereas at the beginning of the project, the relevant elected politicians did not actively support the project, this support grew throughout the project because the results became

more and more visible. A good example of the support of these stakeholders for the WGK approach is the fact that MijnGezondheid, a federal project which connected different eHealth databases together, made use of similar underlying ideas as MijnWGK (e.g. redirection of users using a portal website, single sign-on, etc.).

Because of the intertwined nature of eHealth, many of the other health stakeholders outside of the partnership were informed of the WGK project. There was a broad round of communication to all the relevant software firms which supplied the electronic medical dossiers (EMD) software for the hospitals and GPs. The support of these stakeholders was high at the start of the project and remained high throughout the project.

The mainstream media were one of the societal actors which were less important for achieving societal support, because the project was very specifically oriented towards the information exchange between WGKs and GPs. Nevertheless, the partnership gave a presentation and demo to local media and received more and more support throughout the project (e.g. articles in local media outlets).

User involvement

As mentioned, users were already present at the very beginning (before the procurement procedure) of the project. Ten GPs led the pilot project out of which much of the inspiration would come for the MijnWGK project. Moreover, one of the GPs was part of the steering committee of the project, which shows the high involvement of the users in the project. One example of this high involvement was the fact that the GP who was part of the steering committee contributed to the contents and visualization of the interface of the eHealth tool. Initially, the user asked for a link between MijnWGK and the EMD (electronic medical dossier) of the physicians, which could only be realized if the information of the individual WGKs was somehow connected and the physicians were able to access that information without having to use another "WGK tool" (i.e. the user asked a single sign-on which was enabled through collaboration with the eHealth platform, which caused MijnWGK to become part of the eHealth network of Belgium). Whereas the coordinator was especially focussed on integrating

the available information between the WGKs and stimulating the collaboration between these WGKs, the user had a crucial role in translating the wishes of the physicians (users) to the partnership (i.e. single sign-on, integration with EMD software, connection to eHealth platform). This shows the fundamental role of the users involved in this project, since they were able to direct the project towards an innovation with broader practical applications.

Once the contract with HealthConnect was closed, the users were less involved in the idea generation, but they remained important to test the early versions of MijnWGK. Through mock-ups, the involved users were informed about the functionalities of the application and could give feedback on this test version. This feedback was used to generate better versions. For example, the users commented that the tool should be using different dashboards instead of one to increase the visibility of the data, which was then applied in the application. One of the objectives of the pilot project was to experiment with how physicians could access patient information from the WGKs, but also how GPs could give information about the patient to the WGKs. This reciprocal information exchange had always been a demand from the physicians but has not yet been implemented in MijnWGK because of some of the WGKs' reluctance. Other users were involved at the end of the project to validate MijnWGK or to search for support among potential users of the tool. This group of users also included the patients itself, which is why MijnWGK was introduced to the Flemish Patient Platform (VPP).

Because of the bottom-up evolution of the project out of the pilot project which was initiated by the users themselves, the users had a broad and deep involvement in the project. The users were crucial for some of the strategic decisions which were made in the project. Especially in the stages before the procurement phase, the users were core actors of the project. The users wanted to be involved in the project because of the increased quality of care they would be able to provide when they had access to patient information of the WGKs. They also counted on the mutual information exchange between the GPs and the WGKs to further increase the interprofessional collaboration between the health care professionals. Other user stakeholders such as the VPP were especially involved in the project because of their position as representatives of patients in the health sector and to provide support for MijnWGK.

Role of ICT in the collaboration process

On an architectural level, ICT was crucial for the project. The way in which the partners wanted to implement MijnWGK was highly dependent on the existing national eHealth architecture. A single sign-on to the EMDs of the physicians was only possible by connecting the WGK databases to the eHealth network, either directly through the eHealth platform or indirectly through the hospital hubs. Eventually, the WGKs and the eHealth platform decided to create a new data vault which would be used for the WGK servers, which meant a direct connection on the eHealth network. Without the existence of these critical ICT components, a connection to the EMDs of the individual physicians would have been very difficult to achieve (it would imply that every individual software supplier of EMDs would have to build a connection to the WGK servers).

ICT was also used frequently as a communication tool because of the physical distance between most of the partners. As such Dropbox, video conferencing and teleconferencing were frequently used throughout the project. The mock-ups created by HealthConnect to test the first versions of MijnWGK were also highly dependent on ICT and were used more systematically throughout the project. Overall, these technologies were always used very pragmatically, that is: they had to serve their role in the testing and communication endeavours of the partnership.

Success factors

A couple of things have been crucial for the success of this project. First of all, the position of the federated WGK was essential for the whole process. The federated WGK is an organisation seen as legitimate by the other WGKs to undertake such projects, and therefore supported in its objectives regarding MijnWGK. The federated WGK, therefore, did not need to convince the other partners that they were the best actor to coordinate the project. Second, although the WGKs served the same clients and had the same mission and structure, all of them were autonomous. The contract between the WGKs formalized their relationships between one another in the project and made clear what was expected from them. It also reduced the uncertainty, risk and transaction costs for the WGKs, which enhanced their commitment to

invest in the project. Third, bottom-up growth of ideas and being sensitive to those ideas was critical in this partnership. Not only the pilot project is an example of this, but also the deep involvement of one of the physicians (users) in the early stages of the project. Being sensitive to ideas which were created out of the group of users transformed the project. Fourth, open and constructive interactions between the partners (communication, dialogue, collaboration, etc.) were crucial in this project. Through the formal project teams, but also through informal meetings and bilateral discussions, MijnWGK emerged as a successful system.

3.1.5. Evidence-based practice (EBP) (Belgium)

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Introduction of the project

This case study is about the implementation of an evidence-based practice (EBP) architecture where guidelines and information can be shared and where applications can be connected for the network members to use. The Belgian EBP is oriented towards the development, validation, dissemination and evaluation of medical guidelines for health practitioners. This entails ten health care professions: GPs, nurses, occupational therapists, dentists, dieticians, pharmacists, physiotherapists, speech therapists, midwifes and podiatrists. These medical guidelines ensure health practitioners that they advise patients in an evidence-based manner.

The history of EBP in Belgium is complex and entails twenty years of bottom-up evolution. We use three milestones to shortly sketch this evolution: 1) the creation of Cebam/CDLH, 2) the creation of EBPracticeNet, 3) the creation of EBP Network. The first milestone was the establishment of the Belgium Centre for Evidence-Based Medicine (Cebam) somewhere before 2003. Before the establishment of Cebam, some health actors (i.e. Farmaka and BCFI) were already conducting EBP oriented tasks. However, there was not one actor who was (inter)nationally recognized for its EBP-related work. When Cebam was established, it became

the Belgian branch of the Cochrane institute[14]. Cebam received financial resources from the Minister of Public Health to conduct four tasks: 1) Education in EBP; 2) Making Cochrane reviews; 3) Validation of medical guidelines; 4) Developing a library for medical content.

The creation of the CDLH (Cebam Digital Library for Health) was the first step in the digitalisation of EBP. Physicians were then able to consult a very broad set of medical content (academic papers, journals, guidelines, etc.). The digital library was created with resources from the federal government and with the technical know-how of IVS (an eHealth company). However, the CDLH was underused by the physicians. The people involved wanted to bring the CDLH closer to the work field of the GPs. In the academic centre of the KU Leuven, there was a group of people involved in the development of EMDs (electronic medical dossiers). They got the idea to match the CDLH with the EMDs of the physicians. When a GP filled in a diagnose in the EMD, there would be a link to the available guidelines concerning this diagnose/disease. This application was called the 'Evidence Linker'. The problem here was that every guideline was coded through ICPC or ICP10 codes, but the GPs did not do this in their EMDs. The academic group therefore started to teach future GPs in their education centre to use these codes. The people from the commission of homologous criteria for the EMDs decided to make the Evidence Linker one of the criteria for EMDs, which meant that every software supplier of EMDs had to incorporate the Evidence Linker in its software.

At the time of the creation of the Evidence Linker, there were not many guidelines in Belgium. There were the guidelines of the Dutch GP organisation and the BAPCOC guidelines, which were incorporated in the CDLH. This was however not enough and Cebam was looking for ways to increase the number of guidelines. There was a Finnish publishing company that produced these guidelines, and CDLH bought a license for these guidelines (there were 1000 guidelines in this license) through the contacts of IVS (which was also a distributor of scientific information). These guidelines were translated and contextualized by CDLH. However, there was one problem with the CDLH: the information and guidelines were especially oriented

[14] International network of health professionals that disseminates scientific and medical information

towards general practitioners. This meant that other health care providers and citizens were not able to use the CDLH for their own purposes. The EBP partners, which were already organized in several meeting groups, realized this and the federal government pushed towards a further generalization of EBP for ten health care professions (the specialists had their own international system of medical guidelines and were not incorporated in this group).

This led to the creation of EBPracticeNet in 2015, the second milestone in the complex history of the EBP Network. EBPracticeNet became the dissemination channel for the validated medical guidelines. From this point on, every guideline that was disseminated through EBPracticeNet would be validated by Cebam. However, the medical guidelines were only understandable for GPs and not for citizens. CDLH wanted to develop lay guidelines that were understandable for citizens as well. With money from the Flemish government and together with IVS, they created Gezondheid & Wetenschap, a platform that translates the guidelines into simple information that can be consulted by citizens. At that time, there were a couple of organisations involved in developing guidelines, who all received money from the federal government. There was Domus Medica and SSMG, the two principal representatives of GPs in Belgium, there were some other representatives of health care practitioners (BCFI, APB, Farmaka, …), and there was a multidisciplinary group, founded at the University of Antwerp. The latter group became specialized in the development of guidelines that were made using the thorough validation methodology of Cebam. This group was called WOREL. Due to decisions made by the federal government regarding restructuring and finances, WOREL – who had totally separate objectives and financial resources – became part of EBPracticeNet. Because of the structural resources of WOREL and EBPracticeNet (and also Minerva, who was an actor founded out of the University of Ghent), the other organisations were less and less involved in the development, dissemination and implementation of guidelines.

To prevent a loss of coherence between the EBP partners, the federal government decided to invest in a restructuring of the EBP landscape in 2018, which is the third of the aforementioned

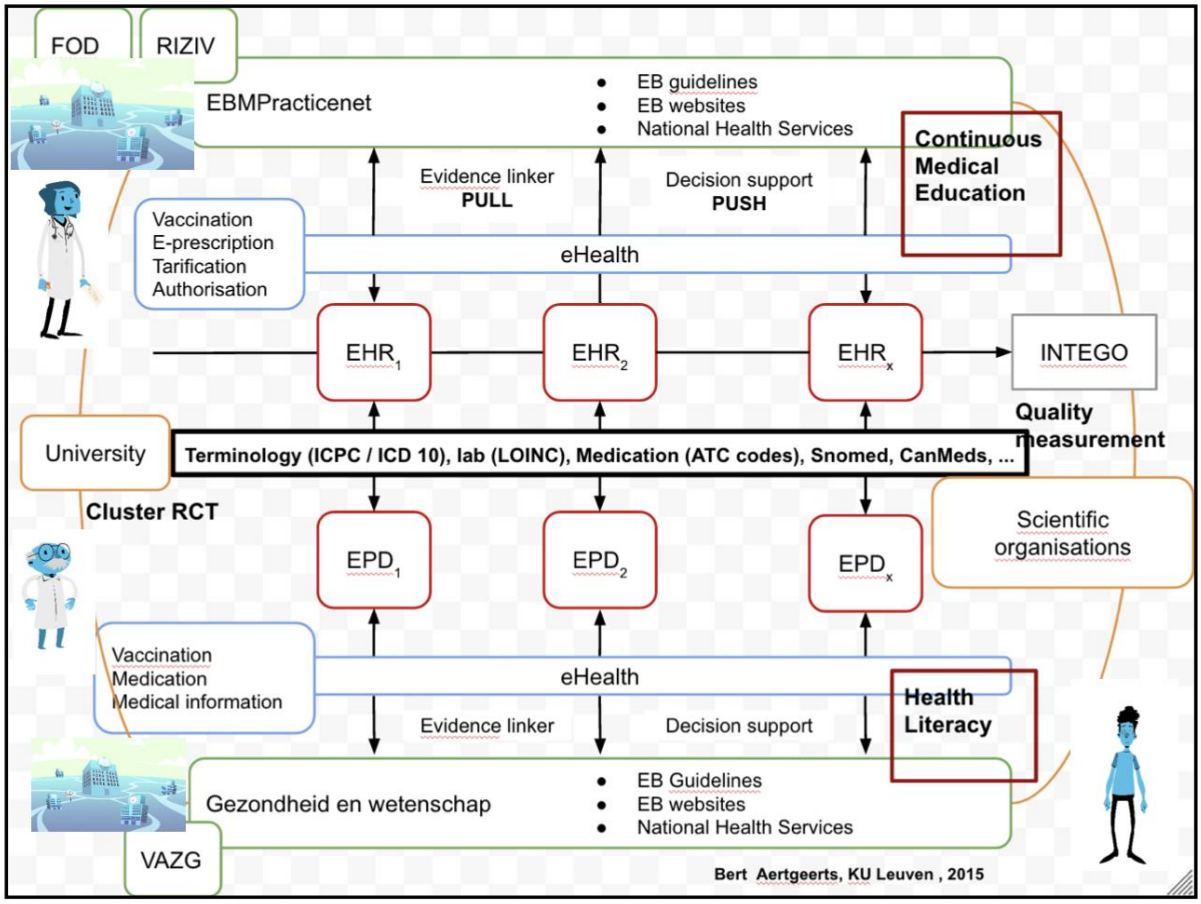
milestones. Another important actor in this landscape – KCE [15]– received the mandate to restructure the Belgian EBP and to construct a single network where all of the actors had their place. Together with the Antwerp Management School (AMS), they created a Network Administrative Organisation (NAO, see Provan & Kenis, 2008).

The eHealth innovation

Because of the long lifespan of the EBP landscape, we consider a couple of EBP innovations in this section, namely the CDLH, the Evidence-Linker, Decision Support, EBPracticeNet, Gezondheid & Wetenschap and a couple of other derivatives of these larger innovations. These innovations are tied to each other through an EBP architecture (Figure 6). The starting point of this architecture is the EMDs (electronical medical dossiers) of the GPs. These EMDs have a push and pull mechanism. The pull mechanism pulls information and guidelines from the CDLH (of which EBPracticeNet is part). The push mechanism pushes information from the CDLH towards the EMD using the information in the EMD to advise the GP about patient specific cases (Decision Support). In practice, this means that physicians can consult medical information (in the form of guidelines or any other academic paper) via their EMDs that are linked through the federal eHealth platform with the CDLH and EBPracticeNet.

[15] Belgian Health Care Knowledge Centre

Figure 7: Conceptual architecture of EBP innovations (Bert Aertgeerts, 2015)



The connection between the content of the EMDs and the content of the CDLH work with ICPC/ICP10 codes that link to specific themes that are relevant for that case. Reversely, the CDLH can also push information to the physicians through their EMD via the Decision Support algorithms which work with information from within the EMDs of the physicians. Instead of searching for information using the pull mechanism, physicians receive case specific advice from the CDLH to help them make certain decisions. The decision support software uses more than 100 parameters to extract relevant information for that case from the CDLH. The mirror image of this architecture is the Electronic Patient Dossiers (EPDs), which give patients information about their medical condition. Using the same ICPC codes as the guidelines, the patient can consult their own guidelines through the Gezondheid & Wetenschap tool. This tool uses the same guidelines as the guidelines consulted by the GP (based on evidence-base practices), and the GP receives information about the patient's condition. The same push and

pull mechanisms can be applied to these EPDs. The Evidence-Linker is crucial in connecting the EMDs of the GPs to the information contained in the CDLH/EBPracticeNet. The Evidence-Linker works similar to a search engine that makes an easier connection between the content of the CDLH and the questions of the GPs possible. This architecture is connected to the Intego project, a real-time morbidity network that registers the frequency of diseases in the population. This is then linked to specific products that are tested in Randomized Control Trials (RCT) and are linked to the guidelines. This allows GPs to know exactly what products are better in fighting certain diseases, but it also allows GPs to follow up on the evolution of morbidity because it is connected to Intego. This whole architecture relates especially to the physicians, but other primary care professionals are able to use the EBP architecture as well. This is why EBPracticeNet was developed. It incorporates ten health professions together. This means that not only guidelines for physicians are present on EBPracticeNet, but also those for the nine other health care providers. The whole architecture as drafted here was already operational when the government decided to create an EBP Network with a steering committee and a core partners group. In other words, the creation of the EBP Network has no impact on the innovations investigated here, but it could have an impact on the future of the EBP landscape.

Many of the functionalities of the EBP architecture as described before are new, not only for the Belgian context but also for the European context. Most of the European countries work with some kind of guidelines for physicians, that may or may not be validated by an authority. However, the way in which all these guidelines are tied into the EMDs of the physicians, with modules to make an easy search possible (Evidence-Linker) and to give physicians case specific, real-time advice (Decision Support), makes this EBP architecture highly innovative. Further, the impact of these innovations is not limited to GPs. Some of the innovations in the EBP landscape open the potential use of the architecture towards nine other health care professions (EBPracticeNet) and towards the citizens themselves (Gezondheid & Wetenschap). The architecture also uses eHealth infrastructure of the government to make sure that these innovations are connected to the larger eHealth system (eHealth platform), which makes diffusion and use of the innovations easier.

When fully used, the potential impact for the health care could be very high, as it provides care providers with crucial information about health decisions based on scientific research. In other words, using these innovations, there are no longer boundaries between scientific knowledge and practical implementation. This tackles the wish of health practitioners to give evidence-based advice to patients, because of the frequently lack thereof in the current reality of online misinformation (e.g. social media, "doctor Google", etc.).

Partnership structure, governance and resources

Because of the long history of EBP in Belgium, and the evolution of the structures in which the actors were involved, it is difficult to use the network governance structures of Provan and Kenis (2008). As we have indicated in the previous paragraphs, it seems as if EBP became more structured over the years. During the first milestone, EBP was limited to a couple of actors which created organizations (such as Cebam) to conduct EBP activities. Informal ties between partners existed to achieve certain objectives (e.g. implementation of the Evidence-Linker). During the first milestone, the partnership can be perceived as a self-governed network (Provan and Kenis 2008), as the partnership depended on the involvement and commitment of all of the actors, without there being significant power differences between the partners. During the second milestone, namely the establishment of EBPracticeNet, the partnership became more structured around EBPracticeNet as most of the EBP partners were also part of EBPracticeNet. Because EBPraticeNet was a new organization which brought most of the EBP partners together, we can argue that the network at that time can be characterized as a network administrative organization (NAO). However, it is also true that EBPracticeNet had activities of its own that were not collectively conducted by the partners (e.g. the dissemination of guidelines). As such, EBPracticeNet can also be viewed as a totally new EBP actor, present in a self-governed network. The third milestone, which created new structures to include all of the EBP partners (EBPracticeNet now became part of an ever larger network, which now explicitly incorporated government in a steering committee), can also be viewed as a NAO, as a network coordinator has the explicit mandate to manage the network. As such, a separate administrative entity was established to govern the network.

EBPracticeNet has a board of directors that is composed of several of the core partners of Evidence Based Practice (EBP) in Belgium[16]. Further, it has several work groups that conduct practical tasks (e.g. editor groups, communication groups, etc.). In the larger EBP Network, there is also a steering committee with governmental actors and an advisory board that consists of both health actors and additional actors. This EBP Network is structured in the following way:

- A steering committee consisted of all the governmental actors together with the network coordinator (a new function) and the KCE;
- A group of core partners consisted of all of the EBP partners who were relevant for the objectives of the EBP Network (these were prioritizing, developing, validating, disseminating, implementing and evaluating guidelines);
- An advisory board was also created that would advise the steering committee about specific issues and consisted of both governmental and EBP actors.

A large difference between the first, informal structure and the newly created, formal EBP Network was the communication between the EBP actors and the government. The communication between the partners and the government was reduced to the formal meetings of the bodies in the EBP Network, rather than through informal dialogue between individuals from the government and the EBP landscape. In the EBP Network, the network coordinator represents the bridge between government and EBP actors. It is the first time in the history of EBP in Belgium that there is an intermediary between these actors. In table 5, we give a sketch of the different actors (public/private) in the different formal bodies of the EBP Network.

[16] A list of these core partners in provided on the EBPracticeNet website: https://www.ebpnet.be/. See also table 5

Table 5: Partnership composition and structure of EBP Network

Formal body	Public	Private/user
Steering committee	Cabinet of Minister of Health FOD VG (Federal Public Service Health) RIZIV FAGG (advising member) KCE (advising member) Network coordinator	
Core partners	KCE Network coordinator	WOREL Cebam – CDLH EBPracticeNet Minerva
Advising board	Network coordinator	Health insurance organisations (mutualities) Patient organisations Health care professionals (more than twelve organisations) EBP core partners Experts

The financial resources were the most important resources for most of the EBP partners in the partnership. Most of them depend for a large portion on the financial aid from the federal government. Some of the actors (such as EBPracticeNet and WOREL receive 100% of their structural and project money from the federal government. When there are tensions between the partners or between the partners and government, they are frequently invoked by this financial (inter)dependence. The motivation to ask the government for money and to develop the applications themselves, is that the EBP partners wanted an independent and neutral organ that develops and financially supports EBP in Belgium, and not an organisation that is driven by large pharmacy lobbies.

Some of the partners perceived this interdependence as communicating vessels. This means that when the budget of one EBP organisation increases, the budget of another EBP organisation is reduced. This creates a lot of uncertainty and competition between the EBP organisations. For example, the financial aid of the government for Farmaka (one of the EBP partners) decreased with the creation of EBPracticeNet and was eventually totally reduced with the creation of the EBP Network. This caused severe tensions, not only between government and Farmaka, but also between Farmaka and the other EBP partners as the

reduction of resources was thought to be the result of the establishment of EBPracticeNet and several other shifts in financial resources to the other partners.

We have to keep this dependence on governmental resources in mind when we consider how explorative/exploitative the innovation process was. There is also a difference between the process before and after the introduction of the EBP Network. As we have said, the network before the introduction of the EBP Network can be considered to be bottom-up directed. It was created by practitioners in the field and most of the innovations were also designed from that field (CDLH, Evidence Linker, EBPracticeNet, etc.). One of the partners describes this phase of the network as a complex learning system that started off from a very simple question (i.e. "How can we use the EMDs of physicians to connect with evidence-based information?"), but became more and more complex along the way. It was bottom-up established and not designed upfront in any way. New ideas were added to the system as it grew and accumulated functionalities. In this phase of the EBP landscape, we could say that the innovation process was very explorative. The financial dependence on the government was still present, but through lobby work of the EBP partners, they received the resources they needed for their explorative endeavours. This changed after the introduction of the EBP Network, because direct communication (and thus lobbying) with government was now more difficult. Government became also more closely involved with the activities of the EBP partners and made decisions that were previously taken by the EBP partners themselves. This caused a perception that the network is now preventing the explorative nature of the EBP landscape and that it becomes more difficult to experiment with new solutions.

Network management

Because of the long history and high inherent complexity of the network (lot of very diverse partners), the partners experienced some complexities (cf. Klijn and Koppenjan 2015). Although the perspectives of the EBP partners were most of the time very much aligned because they pursued the same goals, there were a lot of differences in perspectives over the lifespan of the Belgian EBP. We will give some examples of these differences. As mentioned, some of the EBP partners perceive the EBP landscape as a bottom-up creation, while

governmental actors primarily wanted to control their financial aid. The government needs to legitimize the use of public resources and wants to have a say in investing these resources, while the core partners think they have enough expertise themselves to make legitimate decisions, especially because they represent a large portion of the users. This is translated into parallel decision-making between the core partners and the government. For example, the government organized tenders for tools for radiology, while some of the core partners thought this should be included in the EBP architecture. KCE launched new tools for cholesterol, while this should be part of the architecture according to some partners.

There are also differences in how the network performance should be measured. Cebam is responsible for the evaluation of the network and has developed an evaluation methodology that looks especially at the effect of EBP on the medical conditions of citizens. This is however not the only way in which the government wants to measure the performance of the network. The government also wants to see what the performance of the operations of the network is (short term instead of long term, e.g. use of EBP tools, involvement of stakeholders in implementation projects, etc.), which is not the main priority for Cebam. Cebam wants to look at the effect for the general health of the citizens, and is not concerned with how this is achieved, while the government is highly concerned with how this is achieved (through the EBP Network), because they invest public resources in the network.

There are also differences in perspectives between government and software suppliers of EMDs. For instance, implementing decision support (one of the innovations that gives individualized advise to GPs via a connection between the EMD and the CDLH) and other applications in the EMDs costs money for the software suppliers and generates no return on investment, whereas government reasons that they already paid for the development of the decision support software (the software suppliers only need to implement it), so they are not paying additionally for the implementation.

These differences in perspectives are often caused by differences in strategic opportunities for the partners. As we have mentioned, almost all of the partners are highly dependent on

financial resources of the government (both federal and regional). This causes a lot of tensions between the partners, of which the example of Farmaka was just one illustration. There were similar tensions between EBPracticeNet and WOREL, where the latter desired more resources from the federal government because of the high demands for developing guidelines (that would be validated by Cebam). WOREL believed that EBPracticeNet had a disproportional amount of resources as opposed to them.

Similarly, there was also a tension between the federal government, APB and Domus Medica about medication guidelines. APB has a system to prevent prescribing certain medication to people with some diseases, which would be helpful for the GPs. The government wanted to pay for this system, but only if the software would be free for the GPs. Similar strategic behaviour is visible in other partners' actions. Due to its strong position in the EBP landscape (both as a distributor of scientific content and as an ICT partner), IVS can initiate a lot of innovations in these organisations. When there is no budget to develop new technologies, IVS *prefinances* certain innovations and tests these together with the EBP partners. When the organisation sees the results of these innovations, the organisation has to choose to buy a license or to leave it. Most of the contacts are made between IVS and the EBP partners, without the involvement of the government. As such, when the innovation has proven its worth, government is frequently compelled to invest in this innovation because of the time and money already spent in the innovation. Furthermore, most of these innovations have recurrent costs. This puts a lot of pressure on the total EBP budget and therefore on the financial resources of every individual EBP actor.

The most common strategic complexity in this partnership is interrelated with the financial aspect and is the perceived lack of communication between the core partners and the steering committee. Before the establishment of the EBP Network, the EBP partners could bilaterally negotiate with the government for project finances and they lobbied a lot with the higher management levels of the RIZIV and Federal Public Service for Public Health. Many of the EBP partners were present from the very beginning and have high level contacts within the ministries, even with people that are not mandated to take decisions regarding EBP anymore.

To avoid a fragmentation of resources from the government to EBP partners, the government decided to reduce the contacts between the EBP partners and the government by making the meetings structural through the EBP Network. However, the EBP partners perceived this as a barrier for the communication with the government and believe that the steering committee needs advice from the core partners to make certain decisions (which is now more difficult because the core partners are not present in the steering committee). Furthermore, 20% of the financial support from government has been allocated to the implementation of the EBP Network, while most of the EBP partners did not deem this necessary. This caused a lot of frustration within the EBP core partner group, because they perceived that a large portion of their budget disappeared and their only communication channels with the financing government disappeared as well. This is however more nuanced, because the network is established to rearrange the EBP landscape and to prevent further fragmentation of both financial resources and EBP objectives. This fragmentation is something the EBP partners themselves tried to tackle a few years ago with a general mission statement, but which was unsuccessful.

It seems that the way in which the network has been established, recovers a lot of the mission statement the EBP partners had drafted in the years before the establishment of the EBP Network. However, it also seems that the way in which the structure of the network was set-up (separate core partners meeting and steering committee) decreases the interaction between the steering committee and the core partners substantially. Government wanted to take back the control over the EBP landscape, which is their legitimate role since they finance most of it. But in doing so, they took it out of the hands of the EBP partners without which the Belgian EBP would have never been initiated in the first place. This loss of control over their own activities, resources and future created a substantial lack of trust of some of the core partners in the steering committee.

Dynamics and activities in the innovation process

The idea generation process in the EBP landscape was especially oriented towards interaction and collaboration between certain individuals in the network. Because most of the people in

the EBP Network are practitioners, they easily connect with each other when trying to cope with problems that relate to their everyday practice. These interactions emerged organically out of this group of practitioners, not through formal meeting arrangements or other structures. Simply stated, the process of idea generation in the network goes as follows: when one practitioner has an idea to solve a certain work-related problem, the practitioner then talks this through with some of his/her colleagues who are also health practitioners. They will then seek financial resources to develop and implement this idea. If the idea is considered very impactful (meaning it entails a lot of developmental work, creates new structures or has consequences for many network members), this is considered with the entire EBP network, as opposed to only discussing the idea with some individuals.

Many innovations also arose in collaboration with IVS. IVS is able to realize new features through the EBP partners and the EBP partners use the expertise of IVS to solve certain problems. However, this back-and-forth between the EBP partners and IVS can create problems for the financing government as well, as the financing government is not always in the loop when the EBP partners start experimenting with something. As mentioned, this can have serious consequences for the EBP partners as the government finances some of the innovations created by IVS and has to cut costs in other places (mostly in personnel). The creation of the formal EBP Network and the structuring of the financial aid aimed to decrease this lack of coordination between the government and the EBP partners.

Realizing ideas is the highest priority for the EBP partners. All of the partners were very committed to realize innovations and they went through great trouble in finding financial resources to realize their ideas. One example of that is the implementation of lay health guidelines for citizens. Because of regional differences, it was not possible to create these guidelines with federal resources. However, with funding from the Flemish government, Cebam/CDLH created Gezondheid & Wetenschap. This is a platform that translates the guidelines into simple information for citizens. Although these innovations were paid from various budgets (Minister of Health, Cebam, RIZIV, CDLH, EBP guidelines and dissemination; Flemish government, Gezondheid & Wetenschap), all of them are incorporated on the same

platform. This reveals the nature of the EBP architecture behind the individual innovations (i.e. they are not independent from each other but exist in a larger concept/architecture).

Strategies to achieve societal support for the innovation

Because of their strong dependence on governmental resources, support of elected politicians for the innovations the network introduces are extremely important to the partnership. This support has grown through the years, as have the financial resources for the EBP partners. With the introduction of the EBP Network, it seems that this support is more structurally embedded in the EBP landscape. Decision and accountability mechanisms are created to exercise this support. As mentioned, the EBP partners have done a lot of lobbying to both the ministerial cabinets and the administration to achieve more support for their ideas and this has paid off as the Belgian EBP landscape is an international frontrunner in evidence-based information and guidelines. Other actors of the health sector, outside of the partnership, are also quite important to achieve external support, although most of these actors are already part of, or affiliated with the EBP partners. Because of the tight relationship of the EBP partners with Belgian universities (and especially the medical schools of these universities), support is also created by introducing students to the EBP-related functionalities. These students do an internship with a GP at the end of their education and in so doing, disseminate their knowledge to those GPs. Furthermore, these students become the future GPs, which is a convenient way to ensure support for these innovations. As such, support from the GPs for the innovation has grown throughout the years. The media has the least important role to ensure societal support for the innovations. Occasionally, there are press releases in local and regional media. There is also a newsletter that is shared with journalists.

User involvement

Because the EBP landscape was created by users (especially GPs), the partnership has different levels of user involvement. The highest level of user involvement is the combination of the EBP core partners (Cebam, CDLH, Minerva, WOREL, EBPracticeNet). In all of these organisations, representatives of users (who are in most cases users themselves) are included. Because of the historic importance of the EBP partners in creating innovations and

establishing the EBP architecture, this group of users should be regarded as users who lead the creation process of EBP innovations, as opposed to simply advising or being consulted by the government in this process. Users lead the process and seek financial aid from the government.

Because these EBP partners have their own organisations that are oriented towards EBP in Belgium, there is however still a distance between the EBP organisations and the users who work with these innovations in practice. To capture these user-experiences, there is a second layer of user involvement, which entails the professional groups of the ten health care professions (Domus Medica, SSMG, BCFI, APB, etc.). Representatives of all ten professional groups advise the core partners and the government about the direction the EBP landscape should go. Many of these actors are also the initiators of EBP in Belgium (e.g. Domus Medica and SSMG). They were historically important to realize the EBP architecture that is now used by the core partners and the government. These representatives of the professional groups are also present on a structural basis in the advising board of the EBP Network.

Still, they are only representatives of users, and they cannot capture all of the issues the users have with the EBP innovations. Therefore, a third layer of user involvement was installed. This layer consists of physicians who disseminate the innovations to a broader audience. Besides their function as a physician, they also teach other physicians and undergraduates about the EBP innovations and can therefore capture the issues people have with some of the innovations. They are informed and consulted by the core partners and are very important to inform and listen to other users and capture their concerns.

A fourth layer of user involvement is ad hoc involvement of some users, for instance to test the EBPracticeNet website, or through workshops that capture the needs of the users regarding new EBP practices.

The first three layers do not consist of different clusters of people. People within Cebam (core partners) can also be members of Domus Medica, and they could also teach other people about the EBP innovations in their role as professor at a university. This creates a diverse mix

of user involvement strategies without the need to intentionally involve a large number of individual users. Because user involvement is structurally embedded into to processes of the EBP landscape, user involvement is both efficient and effective. Users are involved because of their role in the health sector and the importance EBP has for their profession. If the EBP partners need advice from users on specific issues (e.g. regarding EBP technologies), they create ad hoc meeting arrangements with some users to include the users' feedback. This mix of structural embedded and ad hoc user involvement creates both support amongst users for the EBP innovations and gives valuable input to enhance some of the ideas of the core partners.

Role of ICT in the collaboration process

ICT was used systematically on some occasions in the project. An example is to stimulate the collaboration between the EBP partners. This became easier because of the single-sign-on connection via the eHealth platform. Because of this single-sign-on, users did not have to login again if they are directed to other EBP websites. This created a smoother transition between the different EBP channels. Also, ICT has been used a lot in obtaining user comments on specific EBP innovations (e.g. the website of EBPracticeNet, CDLH, etc.). There were test environments created to test websites, comment sections were included in the website to improve the website, etc. Additionally, the core partners have invested in specific technologies to enhance the communication of EBP guidelines to the physicians and patients (i.e. Magic App, which is an app that provides information and medical guidelines to both physicians and patients).

Success factors

To be able to understand the innovation process (which has been going on for almost twenty years), we need to look at some of the initial ideas regarding the EBP in Belgium. The ideas (regarding CDLH, Cebam and the Evidence-Linker) were first introduced by some researchers at universities (some ideas were actually part of a master's thesis). These ideas found an implementation ground when these researchers contacted IVS, the company that provided both ICT expertise and access to scientific content.

From there on, most of the innovations introduced in the EBP landscape were an interplay between academics/practitioners who invented some of the conceptual ideas, and IVS who implemented these ideas using their technical expertise. The government was never an actor that contributed substantively to the ideas. However, the government was the most important actor to provide financial resources to make the EBP innovations happen. Without governmental resources, EBP would never have evolved into what it is today. The recent evolution towards a more controlling government (with the EBP Network) seems to indicate that the government not only wants to financially invest in EBP, but also wants to contribute to the content of the EBP innovations. This shift in roles creates tensions between the EBP partners and the government. The EBP partners do not only see governmental financial aid being questioned, but also experience a decrease in their own autonomy because of the establishment of the federal steering committee where most of the important decisions are made. However, the creation of the EBP Network might have a strong positive impact on the coordination of the EBP landscape, as the EBP Network brings all of the relevant actors together (not only the GPs). Government could use their role as coordinator to diffuse some of the innovations made by the EBP partners to other health professions, who are currently lagging behind in implementing the EBP the GPs already have at their disposal. A shift in focus from invention to diffusion might give the other partners the opportunity to catch up.

When government wants to combat the fragmentation of the EBP landscape, but refuses to recognize the existence of a fast, invention group (the GPs) and a slow, adoption group (the other professions), there will always exist a divide between the different health professions. However, this does not mean the invention activities have to be cut from the process. They need to be realizable for the other health professions. In this sense, invention activities can still be tackled by the researchers/GPs together with IVS, but the focus is no longer on the GPs, but on all ten health professions. This might prevent the perception of stagnation (as it is now perceived with the establishment of the steering committee), but at the same time reduce the polarisation between the GPs and the other health care professions by aligning their EBP architecture, concepts and tools.

3.1.6. Centralised digital patient registration (Estonia)

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Introduction of the project

The centralized digital patient registration project is part of a wider eHealth initiative in Estonia that revolves around the efficiency of patient movement between different health care providers through the centralised digital patient registration, digital referrals and also e-consultation. These different initiatives are meant to operate in conjunction, as they have limited impact in isolation. The solutions operating together are meant to reduce waiting times for citizens and reduce costs for both health care providers (fewer double bookings, empty and unnecessary appointments, thus reducing concurring resource costs as physicians are not subjected to wasted workhours) and patients (easier to book an appointment and communicate with health care professionals). The registration system itself offers more options for making appointments and provides an additional communication channel between the patient and the health care provider.

The issue of inefficient patient movement and system transparency was at the core of creating the innovation. The current decentralized health care service provision results in patients having to make appointments through a decentralized system, which included contacting individual health care providers through individual channels. This resulted in a lack of a comprehensive overview of the available opportunities for patients and the health care sector. Individual health care providers offer different communication channels for making appointments and several have developed digital booking systems. Yet, these systems lack compatibility with each other and there are differences in the level of sophistication and digital complexity.

The result of the project was a centralized digital patient registration portal, where all the joined health care providers are inquired about the possible appointment slots of physicians. This information is then uploaded to a centralized location, enabling the patient a comprehensive overview of the available opportunities. To develop this eHealth technology,

the following actors were involved in the project: the Health and Welfare Information Systems Centre (henceforth TEHIK), Ministry of Social Affairs, North Estonian Medical Centre, Other public health care providers, developers, developers of the hospital information systems and Health Insurance Fund as well through contractual negotiations.

The project was divided into several phases. The start of the latest iteration of the solution was marked in January 2017 with the structural reorganisation of TEHIK from the Ministry of Social Affairs IT department and the Estonian e-Health Foundation, after which the tasks of the newly formed organisations was formulated, one task being the development of the centralized digital patient registration. Following the initial problem and solution formulation, TEHIK developed the first prototype in-house. The governmental actors outlined the problem from a patient-centric approach that has been consistently highlighted in national strategies in previous years. The fragmented service provision was a key motivator to centralise patient registration through a centralised booking option. This reflected the vision of the key governmental actors, who aimed to provide a patient centric overview of appointment times. In an effort to gain feedback regarding the initial ideas and the prototype, TEHIK disseminated their conceptions with visits to health care providers throughout Estonia over a period of about half a year. This enabled them to garner maximal acceptance for the idea. In April 2017 the project applied for funds from European Structural and Investment Funds. In July 2017 they received a positive decision for their application and received the required funds, which was supplemented by additional financial support from the Health Insurance Fund. Afterwards, a procurement procedure was initiated by the coordinators, which failed to appoint any contractors because of an underestimation of the costs of the project. This resulted in the need to scale down the initial scope. In February 2018, the coordinators entered into contractual collaborations with the successful bids. This resulted in the project kick-off and actual development phase on 6 April 2018. During this phase, the design aspects of the initial prototype and conception were further developed by the developers. In December 2018 the development was completed after which it went live in North Estonian Medical Centre with a pilot. During this phase, the governmental actors engaged in

negotiations with other public health care providers to formulate a time plan for implementing the solution. The health care providers started preparations for implementing the solution in February 2019. The implementation was determined during individual bilateral meetings with health care providers to determine the optimal timeline with the goal for an implementation for all public health care providers being August 2019. On the 27th of May 2019, the next public health care provider joined and since August 2019 all public health care providers have joined up. Currently, the coordinating actors are aiming to engage in the next phase of development in an effort to build upon the initial functionalities.

The project itself had a more exploitative approach, as the idea of a centralized booking existed for an extensive period already, with an initial (failed) initiative in 2008 (National Audit Office of Estonia, 2014). The governmental actors opted to focus on a solution that was less technically sophisticated with the choice towards less risks being taken to ensure smooth implementation for as many stakeholders as possible indicating the exploitative nature of the project. This has affected the approach of the governmental actors and made them adjust the approach with the latest initiative. They made use of largely existing standards, as the solution depends on being easily implementable in an effort to engage as many health care providers as possible. They have relied on complementing existing booking solutions through the centralisation of data, which does not substantially differentiate from other existing digital booking solutions.

The eHealth innovation

The centralised digital patient registration provides an additional communication channel between health care providers and patients, with which patients are provided a centralised location within which they are able to make a preferred choice for appointments. The appointments can be made with a digital referral or patients can opt for a paid service, which is visually indicated on the platform.

To enable this, the platform interacts with each health care providers' information system (four existing information systems with public health care providers), during which the system

provides information regarding the free appointments and the appointments made by individuals within the system. The health care provider information system provides daily updates regarding all possible appointments. The system operates with identification for which patients use the national identification card with the option to do it with id card or mobile ID. For patients with referrals the data is obtained from the health information system, which is a centralized system that stores the health data of each patient. All health care providers are obligated to upload referrals to the health information system, which then provides the centralized digital patient registration the necessary documentation about the patients' need. The innovation relies on standard components, standard java, browser and applications with little technical innovativeness. Data exchange occurs on HL7 message standards, which is an international and common standard within the Estonian health care system. These functionalities are possible with these technologies due to their widespread usage, which simplifies widespread implementation. The aim of the project was to use well-known components and rely on their centralised application on the national level, which highlights the innovative nature of the solution. The use of general components and the national digital infrastructure were key to enable the implementation of the solution.

Currently the innovation has been fully implemented with base functionalities developed and the actors are looking to expand with the additional functionalities (for instance the option to pay for appointments on the platform). TEHIK were very reluctant to be overly ambitious in the initial phases and opted for an approach to implement a minimum workable solution, which would allow further development. The leading actors (TEHIK, Ministry of Social Affairs) are looking to make use of the data that a centralized solution makes available, which enables a comprehensive overview of all appointments made to public health care providers. This can provide assistance in optimising service provision and meeting patient demands. Also, user-friendliness was actively sought in later stages, which, during the project was actively recommended by the developers.

The initial implementation of the solution was successful, as patients have been provided a centralized location for making appointments, but how it is received by the citizens and its

effect on problems in the health care sector remain to be evaluated, as the solution has been in widespread use for less than a year. As a standalone component, it provides limited help to alleviating the problems existing in the Estonian health care sector and by itself its effects remain limited. The solution can result in reduction of double bookings and overview of possible free appointments, but it does not affect the overall amount of appointments.

The innovation is novel in its idea of centralising a common booking system within the health sector to improve transparency and user-friendliness. The centralised overview of all the possible options with public health care providers and joined private actors enables patients to move towards customising the service according to their wishes and make a more informed decision. Digital patient registration to date has been provided by various health care providers in a decentralized manner and certain solutions have had more functionalities, which is why the solution itself lacks a certain novelty at the technical level. However, it is part of a larger effort to create user-friendly functions within the health care sector and is part of a public sector led initiative that involves several components to empower the patient.

Partnership structure, governance and resources

The governance structure of the partnership was divided into two levels, namely the project team and the steering committee. It was a fairly standard setup for these types of government led ICT projects, where the project team formulated problems and solutions and the steering committee brought it into the wider context by providing top level managerial support, accentuating the possibility of changes and managing the funds for the project. The main part of the interactions between the partners occurred on the level of the project team. On the strategic level, the Ministry of Social Affairs retained the role of the leading organisation. The steering committee included the Ministry of Social Affairs, TEHIK, Family Physicians Association of Estonia, Estonian Hospitals Association, Estonian Health Insurance Fund. TEHIK, which is an ICT competency centre under the Ministry of Social Affairs, was the coordinating actor in the project team. The project team consisted of TEHIK, the Ministry of Social Affairs, ICT developers (Quretec, i62, Resta, Clarified Security), health care providers implementing

the solution[17] and their personal information systems' developers. Efforts were put into engaging patient representative organisations as well.

The partnership is strongly based on governance by a lead organisation (Provan and Kenis 2008), as on both levels a lead organisation provided direction for the partnership and possessed the decision-making power. TEHIK has provided the technical competency and on the technical level they were the main coordinating actor for all of the developments. TEHIK is the subordinate organisation and IT unit for the Ministry of Social Affairs, who is the product owner and also leads the steering committee. TEHIK has consistently made use of its advantageous position, as they were responsible for maintaining the overall direction, which has been emphasised by other engaged actors and partners. This has been due to perceived limited benefits, limited perceived engagement and the coercive approach from the governmental actors. The health care providers possessed digital solutions of varying levels of sophistication and functions, which made a centralised solution less appealing. Motivation to actively participate was further impaired by perceptions of limited engagement and coercive approach from governmental actors who initiated the centralised digital patient registration project.

Health care providers and their representatives especially brought knowledge and experiences regarding the existing work routines of booking appointments into the project. Health Insurance Fund and Ministry of Social Affairs stimulated the health care providers to interact with the governmental actors to find the solution and provided the contributing surrounding institutional framework. The ICT developers enabled crucial technological resources to develop the digital solution.

For the public health care providers, there were limited incentives to engage in the project, as their participation was mainly connected with the fact that they provide public services and contractual relations necessitated their engagement in the project. However, private health

[17] North Estonian Medical Centre was from the beginning of the project, other health care providers joined in later phases

care providers obtained additional patients by being part of this project, thus enabling them more potential profits. Furthermore, health care providers did not have to maintain their own digital booking systems anymore. Some actors did opt however to retain their individual digital solutions, thus minimising the possible benefits. For engaged governmental actors, the project was an opportunity to address longstanding problems through digital solutions which needed to result in a more citizen-centric solution.

Network management

During the project, several complexities arose that needed to be addressed:

- Differences of opinion regarding possible scope and technical aspects
- Differences in organisational culture
- Strategic behaviour, which was initiated by differences in priorities

The scope of the project at the initial stages remained a point of deliberation, where actors had different opinions regarding the extent of actors that had to be involved in the development of the solution. An additional point of discussion was whether the solution should remain limited for public health care providers or should be available for all relevant actors. Key actors had to consider whether there was prevalent interest in the engagement of family physicians and private health care providers as well, and whether governmental actors possessed the possible stimuli to motivate them to collaborate.

Another difference arose with the technical details regarding the solution, as user-friendliness aspects regarding the user interface (UI) and components regarding interactions between different systems came into discussion. This was connected to the fact that actors had various interpretations regarding the UI and regarding the interactions of the centralised digital patient registration with the patient portal that retained the necessary data. Due to its past history and organisational background, the project was perceived to lack a modern approach to user-friendliness, as TEHIK and Ministry of Social Affairs used an approach based on existing standards and practices. Some of the developers proposed more streamlined options that would have required changes with the existing standards. As a result, there was a misalignment between the various interpretations about the optimal approach for the solution.

The differences in organisational culture arose during the development phase, where TEHIK relied far more on established routines than private developers, which required the developers to adjust to accommodate to TEHIK's needs. Private developers were keener towards changing existing system components, like adjusting message standards, to facilitate the most efficient solution. On the other hand, TEHIK operated within an established institutional framework, which led them to be averse to changes to existing system components, opting to choose to adapt the solution to the established framework.

Strategic behaviour has been present in the project, which is also strongly acknowledged both by the coordinating actors and the health care providers. This was due to the clear difference in perspectives between health care providers and governmental actors. For TEHIK and Ministry of Social Affairs it was an opportunity to centralise and gain a comprehensive overview over the field of health. Strategic documents from Ministry of Social Affairs highlight the priority of transitioning to a more patient centric environment in health care. For health care providers, the project served as another booking option, which would provide a platform for competition of patients and a need to redevelop their internal processes. The at that moment decentralized nature of bookings allowed the health care providers to employ solutions and processes that were impossible with a centralized approach. As a result, governmental actors and health care providers had differing priorities. The lack of a proper value proposition for health care providers affected their stance towards the project. Therefore, most of the health care providers were rather critical with regard to the project. A certain amount of strategic behaviour arose during the development process, as the question of the division of tasks arose for the developers. This was due to the fact that the registration system was complex and worked on the interaction of several other existing systems. Developers were assigned to operate on different systems and thus were competing for certain tasks with other actors. Therefore, developers had incentives to minimise the possible workload on their tasks and delegate issues to other developers. This was related to minimising resource costs.

TEHIK was mostly focused on instating connecting strategies in an effort to provide the widespread acceptance towards the project. To overcome existing complexities, multiple measures were instated.

- Rounds of bilateral meetings between health care providers and governmental actors to find common ground
- Establishing a strong interaction arena during the development phase through emphasis on open communication and regular meetings
- TEHIK and the appointed project manager exhibiting a mediating role
- Joint testings organised by TEHIK to enhance common understanding
- Health Insurance Fund instating an obligation to implement the centralised digital patient registration through contractual conditions[18]

To address the strategic behaviour based on the variety of interests, the governmental actors (Ministry of Social Affairs, TEHIK) engaged in active interaction through various instruments including meetings, consultations, conception dissemination with the health care providers in an effort to bridge the perceived gap between the actors. The aim was to establish a common understanding regarding the problems addressed, the solution to be implemented and the possibilities moving forward. This enabled the health care providers to comprehend better how TEHIK and the Ministry of Social Affairs perceived the problems and what their main priorities were. In exchange, TEHIK received knowledge of daily work processes on a more technical level and an overview of the health care providers' business logic. The goal was to enable the actors to better understand the problem and the effect of possible solutions.

To address possible difficulties on a technical level within the project team, during the development phase, the coordinating actors aimed to institute an informal climate in the project team, where individual actors from different organisations could address each other directly within the project. The goal was to maintain open communication and information exchange, which served as the basis for structuring interactions during the project. Since TEHIK had experience with conducting IT projects, the organisation had the competences to create a suitable development climate. TEHIK enabled an informal climate by introducing

[18] Public health care providers have contractual relations with the Health Insurance Fund due to their role as public health insurer. The contracts dictate the procedures covered, but during the latest rounds of negotiation, the Health Insurance Fund added conditions with the requirement of having implemented the centralized digital patient registration

communication channels with all the developers through the use of a Skype group chat, where they could interact with each other directly without the necessity of mediation from the coordinating actor. Informal and ad hoc interactions were complemented by formal, weekly progress meetings through Skype. During these Skype meeting, the technical actors provided an overview of the current progress, which was used to disseminate necessary information amongst actors and stimulate cohesion. Formal meetings especially served as progress updates rather than as a problem-solving arena, as developers were encouraged to interact immediately when problems occurred rather than to wait for the involvement of TEHIK. However, the formal meetings did provide an additional deliberation arena, as actors were given an opportunity to highlight issues or raise ideas.

Throughout the interactions between the developers and governmental actors during the development phase, TEHIK made use of their coordinating role, as they maintained the overall scope and focus during the project and had a mediating role during conflict resolution. The project manager kept a daily overview over the progress and on pertinent situations served a role in finding common ground for further action. Development of the registration system as based on the general agreement on finding solutions through deliberation, which all actors agreed upon to ensure maximum amount of support. This was enabled through trust in TEHIK as the coordinating actor. Trust towards TEHIK was built around the ICT competency of the organisation and its strong capabilities to connect individuals.

To encourage additional cohesion, TEHIK hosted joint testings that involved all key actors during the development phase. TEHIK gathered them to a single location and then went over key procedures jointly. On a technical level, this provided help to a relatively limited extent, but it was instrumental in enabling the actors to reach mutual understanding through increased interactions and served to get everyone on the same page. TEHIK was able to do this at limited occasions, as there was geographical distance between actors, which inhibited the consistent occurrence of these interactions.

Initial strategic interests were additionally offset by the actions undertaken by the Health Insurance Fund. It was the acknowledgement from governmental actors of past failures in the

field of e-Health, which incentivized a more coercive approach through a new round of contractual negotiations to reorient partners towards the implementation of the new initiative. As public health care providers carried out a publicly funded service, it provided the governmental actors with the opportunity to set rigid implementation deadlines, which were set to August 2019.

Dynamics and activities in the innovation process

The centralized digital patient registration has been a longstanding initiative and the core ideas were mostly established by the coordinating actors at the offset of the project, which was influenced by the historical legacy and interests on the national level to reorganize the eHealth system. The governmental actors reflected their initial vision through the design of an initial prototype, which conveyed their specific vision both to health care providers and technical actors. This limited the possibility of new ideas being proposed and implemented despite the goal of TEHIK to garner the maximum amount of acceptance possible (I1).

However, before the development phase, the coordinating actors did engage in an extensive period of collecting feedback from various health care providers by providing them an opportunity to test the prototype and its functionalities. Additionally, both the Ministry of Social Affairs and TEHIK held meetings to engage health care providers into the process. The meetings were both bilateral and multilateral which allowed to consider the position of each actor. It did result in certain shifts, as it became clear that initial plans to implement an opportunity to pay for visit was unfeasible, as a centralized solution was unable to ensure the transactions between the patients and the health care providers. However, most substantive propositions have remained part of a roadmap, as mainly technical issues were considered.

It is clear that the core ideas have been strongly pushed by the coordinating actors. The technical elements did remain open for discussion and TEHIK remained receptive, but a level of scepticism existed regarding the input of the health care providers and the developers due to existing limitations. The existing limitations, like lack of technical competency, budgetary constraints or the inability of the solution to support all the desired elements, provided the

instruments for the coordinator with which to limit possible change. Questions primarily arose with the technical elements, which necessitated interactions between actors to address the incompatibilities and issues. These were mostly related to user-friendliness and existing functionalities, like option to pay the visit fee on the system. TEHIK did facilitate interactions through the provisioning of a climate that benefitted open communication, where actors were provided the freedom to propose ideas for improvement based on initial tests of the prototype.

The leading actors were very committed to the implementation of the idea. Both the Ministry of Social Affairs and TEHIK contributed considerable resources to the formulation of a framework, which enabled the implementation of the idea. The commitment of the coordinating actors to ensure their initial vision affected the ability of other actors to bring about change. This affected their position formulation within the project, as they recognized the imminence of a centralized solution. The feasibility of the idea remained a strong consideration despite the leading actors' pressure to public health care providers, as TEHIK reoriented its initial approach to make the solution more user-friendly. One of the core principles of TEHIK was to use as much general components as possible to enhance its applicability for various actors, as anything experimental would increase implementation costs for health care providers, which they saw as a key motivating factor. Additionally, the initial engagement of North Estonia Medical Centre resulted in crucial information input that resulted in higher level of feasibility.

Despite the frequent communication of the vision, the inability to convey a value proposition for health care providers to implement a centralized registration system has inhibited active participation of the health care providers. The governmental actors are motivated by the efforts to design a more patient centric system, which provides the patient a more proactive and transparent health care system. This is based on national strategies. However, these interests are based on a macrolevel perspective, which has marginal consideration over the day-to-day operations that are crucial for the health care providers. For health care providers it was clear that compatibility issues with the other options for booking remains an issue,

which has affected their motivation to actively engage with governmental actors to further develop the patient registration system and maintain a more passive role as implementers. Implementation was strongly based on contractual obligations to implement the centralised registration system. This has resulted in a certain level of scepticism from health care providers over the current state of the solution. The coordinator has aimed to increase incentives through highlighting the reduced costs of a centralised digital patient registration, where the health care providers lack the need to maintain their digital booking system. Additionally, TEHIK has looked to increase value proposition with the use of a roadmap that highlights possible future functionalities, which align with the interest of different actors.

Strategies to achieve societal support for the innovation

As the problem has been widespread and has received media coverage throughout the years, the idea of a centralised digital patient registration was already under considerable public scrutiny and attention before the actual initiation of the project. The focus therefore was on persuading relevant actors about the feasibility of the solution. The project experienced both strong pressure and support to succeed at the start and throughout the project.

Media provided very strong pressures as well as support for the implementation of the solution. Various news articles covered the increasing problems with waiting times for medical assistance. The coordinating actor, TEHIK, participated in disseminating information about the solution in the later period of 2019 through different media channels. However, the media has misinterpreted the benefits and purpose of a centralized registration system, as they have highlighted its purpose in reducing waiting lines, which creates problematic over-expectations amongst patients. This has necessitated TEHIK to stress its actual purpose in offering citizens an overview over the free appointments and how the solution itself has limited opportunities for achieving an increase in overall available appointments.

Elected politicians and top-level civil servants provided additional pressure due to the failed nature of previous IT initiatives within the field of eHealth. This was crucial in providing the necessary authority to pressurise health care providers to implement the solution. This did

result in additional pressure to project team, as steering committee relayed the expectations of top political and administrative leadership, which affected the capability of the project team to tune down the scope of the project. However, it was crucial in attaining the necessary support to implement the solution.

Societal support was achieved through media articles and the wide dissemination practices conducted by the leading technical actor, TEHIK, who introduced their solution to other actors in the health sector as well to the wider public. To create support and clarity, TEHIK decided to spend resources to disseminate their ideas, conceptions and introduce the innovation after an initial prototype was presented. However, as their efforts were mostly directed towards health care sector actors, wider public received relatively limited information and the patient registration system went live with quite limited media coverage. As a result, there was no perceived change in support from the wider public.

User involvement

The public health care providers were involved throughout the project to various extent. The key actor for providing the perspective of the health care provider was the North Estonia Medical Centre (NEMC), who was involved at the start of the project. The initial phases of the project limited other health care providers' engagement to information dissemination and consultation, as they could offer feedback on the initial prototype. After the eHealth tool was piloted in the North Estonia Medical Centre, other public health care providers within the Hospital Network Development Plan were involved more extensively, as they started making developments within their existing digital solutions. The changes revolved around relevant work processes for making appointments and developments to the existing systems to handle the requests for free appointments. Additionally, private health care providers who volunteered were additionally engaged. The representatives of health care providers were also engaged, as the Estonian Hospitals Association and Family Physician Association were engaged in the steering committee.

The engagement of health care providers was necessary for guaranteeing the widespread implementation of the centralized digital patient registration, as its benefits are ultimately

dependent on the amount of joined health care providers. The engagement of the health care providers was crucial for the governmental actors, as it improved their perception regarding the work processes surrounding digital booking.

The incentives to join with the project at its current state has been relatively limited, as the solution itself has currently focused on base functionalities to guarantee a workable solution. Certain health care providers are equipped with digital tools that provide more functionalities than the current centralized solution. Additionally, the usage of the registration system has not been sufficient to merit its benefits for the larger health care providers. Functionalities that enable an increased value proposition for health care providers are only being planned by TEHIK with the next phase. Currently the higher level of engagement has been rewarded through the opportunity to receive more attention to propositions and issues (I4).

User engagement enabled the transfer of user-oriented knowledge, which enabled to detect and respond to any issues on the technical level that could be addressed. Additionally, users provided feedback that could be taken into consideration for future applications. Coordinating actors took technical feedback into consideration and adjusted the solution accordingly. However, health care providers perceive that their recommendations have yet to be implemented.

User involvement in the centralised digital patient registration project has been with mixed success. Although NEMC was engaged from the start and they provided relevant user perspectives, other health care providers have considerably different internal processes and their perspectives were only considered at later stages. Additionally, health care providers have perceived limited benefits from the project and the problems the solution has brought along. Earlier customised solutions have now become impossible under the new system. This affects their motivation for active participation.

Role of ICT in the collaboration process

The use of ICT tools for communication and project management has been the norm for ICT projects in the public sector. ICT had a role in supporting communication between various

actors, as various tools were used to ensure open channels and ensure progress within the project. The project team used emails and group chat functions within Skype to enable an open communication arena, where each actor could highlight critical problems for them directly to the project team. Skype served as the supporting tool for hosting weekly progress update meetings during the development of the project, which enabled the partners to remain in frequent contact. This offered an additional option for informal ad hoc brainstorming between different developers, as they could be in contact with limited costs with possibility for input enabled for other developers.

Additionally, the project team implemented project management tools like Jira and Confluence, which however found limited usage, as technical actors used the tool irregularly and rules were not implemented. During the initial prototyping and its updating, TEHIK relied on Axure, which is a common tool for prototyping and prevalent in various projects within the public sector.

The basic ICT tools proved invaluable during the development process, but project management tools were of limited benefit due to the failure of the coordinator to organise its use. After the development phase the stakeholders remained reliant on basic ICT tools with no new management tools introduced. There is limited willingness to provide expenditure for complicated tools, as these tools can result in oversteering, which the coordinating actors were eager to avoid especially during the development phase.

Success factors

The innovation process was strongly affected by past reform attempts. The solution relies on existing digital infrastructure and its success is dependent on how the health care sector incorporates eHealth initiatives as a whole. The prior failed initiatives strongly affected the approach of governmental actors towards a more coercive approach, which limited the health care providers' ability to negotiate the concepts surrounding the solution. The health care providers have therefore retained a critical view of the project itself with a limited level of enthusiasm towards improvements.

It was very beneficial that the problem itself was widely accepted amongst different actors and the coordinating actors made their own perspective very clear from the start, leaving limited space for deviation. The dissemination activities conducted by the coordinating actors (both TEHIK and Ministry of Social Affairs) resulted in a well communicated vision at the moment the project was initiated.

The collaboration process had varied success. The developers were very positive regarding the open environment created by the coordinating actors. However, the late involvement of other health care providers besides the North Estonia Medical Centre created difficulties in perceiving the internal processes of the other healthcare providers and the possible errors that may arise.

Successful implementation was the result of learning from past mistakes in technical aspects, engagement of a health care provider from the start thus incorporating their perspective, opting towards a more coercive approach and TEHIK's role as the coordinator. In combination, they enabled a climate where the actors were able to implement the solution at a limited timeframe.

The centralized digital patient registration project highlights that the successful implementation of a complex project requires very strong leadership and a strict scope. The health care providers had strongly varying interests and accommodating to each of their needs makes it very difficult to implement a successful solution. The strong support from the administrative and political leadership enabled the necessary authority to convince health care providers to implement the eHealth solution. This partnership had a large number of stakeholders and the perceptions regarding the benefit of the solution varied due to existing levels of technological sophistication that were resultant of the previously decentralised nature of booking appointments.

3.1.7. Proactive service provision for disabled people (Estonia)

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Introduction of the project

The objective of the project was to automate the process of application for disability in an effort to reduce personnel resource costs (as application review is a very time-consuming process for physicians involved in the review) for the Social Insurance Board and simplify the current application system for users. Currently, individuals first apply for disability and only then they can start applying for various support services from various organisations such as rehabilitative services and aids (e.g. wheelchairs). After handing in an application to register their disability status, the experts in Social Insurance Board will evaluate the level of disability based on medical information available in the health information system. However, it provides no immediate access to other services, which require additional applications. These services have different dates of expiration, which requires individuals to keep track of when a service expires. Applying for disability by itself therefore pertains no value and the application process for various services is fragmented between different organisations and levels, which makes it increasingly difficult for users to perceive the opportunities available for them. As a result, there can be confusion whether service provision occurs through the Social Insurance Board or whether it is a service of a local municipality. This creates excessive administrative burden for an individual to keep track of all services separately.

The partnership decided to redesign three different services into a single logical service to provide increased benefits for parents with disabled children. The goal of the project was therefore to limit the amount of applications that a single patient had to submit for different support services and make provisions for proactive service provision for support services based on the initial disability application and the available data. This required to pay more attention to difficulties of parents of disabled children in applying for the necessary support schemes (which typically creates a lot of burden for them), by incorporating user-perspective into designing the service. The result of the project is a redesigned service process, where the

Social Insurance Board proactively initiates the application process for different support schemes based on the application for disability.

The project is yet to be finished, as it is in the middle of piloting the redesigned service that is set to finish in March 2020. The project started out with a problem formulation in late 2018 and early 2019. This was necessary to apply for the innovation programme led by a team from the Government Office. The project continued with problem analysis, mapping and focus setting within the framework of the innovation programme. During these phases, all members of the project team were engaged, with additional contributions from Family Physician Association and municipalities. After the reorientation of the initial focus, the new approach continued with idea generation, which resulted in the solution going into prototyping and testing. During the testing phase, the Social Insurance Board and the Ministry of Social Affairs remained the main contributing actors. By this stage, the project team had successfully finished the innovation programme framework and continued independently within the Social Insurance Board. During this period, the Social Insurance Board started contacting the target group in an effort to find voluntary participants to test the idea.

The project was strongly explorative, which was enabled by the general framework and the approach undertaken by the Social Insurance Board as the project leader. The initial idea, which was limited to the automation of the application for disability, was redesigned as a result of the workshops. During the workshops, the target group and their representatives were able to highlight and communicate key issues from the user side and it became clear that the benefits of the initial idea were of little value for the users. Throughout the project, creative thinking was infused through user mapping, process mapping and other innovative procedures. For different partners the novel service design methods used, differentiated from the standard procedures that they had become accustomed to within the field. This deviation resulted in an opportunity to test multiple different alternatives, which was the aim of the coordinators.

The eHealth innovation

The redesigned service makes use of the national Health Information System, Social Insurance Board Information System, X-Road for information exchange, Delta document management system and Excel for data processing and analysis. It is focused on backend processes, where the Social Insurance Board based on existing data has redesigned data processing and analysis, enabling proactively to commence the application process for support services the new applicants are qualified for.

As a result, a parent of a disabled child has to submit a limited number of applications, as the Social Insurance Board makes use of the information they have access to. During the initiation of the new service process, the parents have to provide consent to the Social Insurance Board to process and use the personal health data of their disabled children for analysis. Following the provided consent, the Social Insurance Board initiates the disability evaluation and additionally support services aimed towards the child based on the info from their health data.

The innovation makes use of the national digital infrastructure that is irreplaceable within the Estonian context. In the field of evaluating disability levels and providing certain support services, the Social Insurance Board possesses a monopoly position thus owning the key digital solutions. They are the sole providers of the necessary data used to conduct the evaluation of the disability level and connected support services.

The innovation is still in the piloting phase and the partners are looking for possibilities for further expansion. During the piloting phase, the partnership successfully validated their idea. This has been additionally supported by the leadership of the Social Insurance Board, who actively look for further opportunities of digital transformation and proactive service provision. The expansion is looking for options to incorporate the use of AI into the process of determining the level of disability for the patient. Namely, the Social Insurance Board is looking for opportunities to simplify the process of information transmission for the expert physicians carrying out the evaluation process. This is achieved through automating decision-making in cases where the health condition remains stable and is highly unlikely to change.

This would enable the expert physicians to focus on evaluating cases, which requires more attention. In addition, the Social Insurance Board has been looking for further options of incorporating and strengthening communication between all relevant actors in the field, including municipalities, who possess the information regarding the services provided on the local level. This would enable the Social Insurance Board to provide a more holistic service to its users. User representative organisations remain hopeful that the solution can expand on initial target groups to incorporate more subgroups who could benefit from the proactive service provision.

The successfulness of the innovation is predicated on the fact that the Social Insurance Board exhibited active willingness to change their approach based on the information that various actors provided. As was perceived by key actors, the innovation programme provided by the Government Office was key in enabling innovative ideas to come forth and gather the relevant actors. The Social Insurance Board actively adapted it, as they attempted to interact further with the partners.

The innovation serves as a fresh approach in the field of social welfare, where changes are usually brought forth through legislative means. Modern service design measures in combination with ICT have proven to be instrumental in inspiring a new alternative way of bringing forth more user-friendly and citizen-centric solution, which is critical in a policy field that is emotionally sensitive. The fact that the Social Insurance Board has actively decided to go further from the organisation centric approach to incorporate alternative perspective has served to create a more holistic overview of the field.

Partnership structure, governance and resources

The partnership was composed out of key actors within the field, who formulate policy, provide necessary services or possess the competency to represent the interests of the target group, namely the parents of disabled children. The involved organisations were the Social Insurance Board, the Estonian Chamber of Disabled People, the Ministry of Social Affairs, the Ministry of Economic Affairs and Communication, the Health and Welfare Information

Systems Centre, the Unemployment Insurance Fund, the Estonian Family Physicians Association, and the Government Office of the Republic of Estonia. Out of these organisations, the project team composed of members of the Social Insurance Board, the Estonian Chamber of Disabled People, the Ministry of Social Affairs, Ministry of Economic Affairs and Communication, the Health and Welfare Information Systems Centre, and the Unemployment Insurance Fund. As the partnership developed further, the constellation of actors changed, as the project shifted towards children with disabilities. The governance structure surrounding the project was highly informal and based on voluntary participation, and was led by the Social Insurance Board. Social Insurance Board engaged partners based on the pre-existing connections and relevance with the service provision. This was also connected to perceived possible benefits from active engagement, as the Social Insurance Board was eager to establish a climate where innovative ideas would come forth. The Social Insurance Board took up the administrative duties within the project, determined the composition of the partnership and arranged the necessary information change, providing minimum burden for other actors within the arrangement. Their monopoly on information exchange, asymmetrical advantage in allocating resources, product ownership and the position within the arrangement exhibits a characteristic setup of a lead organisation (Provan and Kenis 2008).

The Social Insurance Board provided key human resources as they were the initiating actor within the partnership. They provided the necessary expert knowledge about the service delivery processes, manpower through specialists assigned to the project and experience in feedback with the problems about the current service. They have control over the service provision, which grants them authority over the decision-making process. The Government Office played a key role in providing a general framework through the innovation programme. This provided the actors an opportunity to employ more novel service-design methods to change the service provision for the disabled. The innovation programme is a Government Office led initiative, with which they offer stimuli to redesign public services that relies on user-centric principles connected to open innovation. Estonian Chamber of Disabled People

was crucial in providing key human resources, especially regarding their user knowledge about the interactions between users and governmental actors.

The partners' incentives varied a lot. For the Social Insurance Board, the project enabled to aim for resource costs savings through reduced burden for expert physicians and designing a more client centric service thus increasing user satisfaction. The Estonian Chamber of Disabled People as the representative of the target group were enabled a position with which they could influence the service provision and bring out some of the key issues that have affected the field of social welfare. The Ministry of Social Affairs remained cautious throughout the process due to deviation from standard procedure that the existing process entailed.

Network management

There were different types of complexities present in the project, but they entailed a somewhat limited effect on the project itself. Most of the actors were very strongly connected with each other through different policy arenas already before the project was launched, which resulted in limited complexities. However, a certain amount of differences in problem formulation and implementation did become clear during the project:

- differences in approaching the problem;
- organisational culture dictating behaviour;
- strategic behaviour based on organisational priorities;
- lack of relevant knowledge.

The central problem itself was widely accepted amongst different actors, but there were differences in the ways of approaching it. The Social Insurance Board initially relied upon existing work processes and issues with the application process for disability. However, the Estonian Chamber of Disabled People highlighted that there was a need to evaluate the aspect of administrative burden and the benefits for service applicants. The Health and Welfare Information Systems Centre provided an overview of possible ICT based solutions to address service provision. The Ministry of Social Affairs was cautious towards innovative approaches, as it was their experience that change required considerable time and resource expenditure.

During the initiation of the project, there was a perceived difference in organisational culture between different actors, which did dictate their behaviour. The initial scepticism from the Ministry of Social Affairs towards the project was based on their established work processes and routines, which differed from the setup and objectives of the project (incremental development versus the radical development proposed by the project).

During the idea generation phase of the innovation process, there appeared an element of strategic behaviour. Especially municipalities and health care providers were unwilling to join the project and adjust their work processes due to potential increase in personnel costs through increased administrative burden for relevant officials. Additionally, the Ministry of Social Affairs had concerns related to the incompatibilities with the wider legal framework. However, the voluntary nature of the collaboration and the fact that most of the changes accrued within the Social Insurance Board, the strategic behaviour remained limited and did not affect the collaborative arrangement.

Actors made efforts to solve the problems by using both connecting and exploring strategies. The basis for the choice was due to the fact that engaged individual actors were open towards learning, as was exhibited through workshops and the incorporated service design methods. The project manager from the Social Insurance Board was not rigid within the existing work processes and emphasised the importance of adopting a new approach. However, despite the willingness of individual official, the work routines and culture instated within the Ministry of Social Affairs was difficult to change. Focus was oriented towards gathering new information, providing an arena for all actors to bring up their propositions and creating interactions between the actors to foster mutual understanding. The project team perceived the existing complexities sufficiently well, and to address them, they relied on several elements to bridge differences in perspectives and cultures:

- workshops for enabling interactions and bring forth ideas;
- ad hoc visits to discover possibilities and comprehend the position of actors;
- project manager with a strong mandate to guide the process.

The crucial factor in addressing differences was provided through engagement of the relevant actors in idea generation through workshops arranged within the innovation program by the

Government Office. Each participant was provided a platform to elaborate on ideas they perceived to be important and for all actors to analyse its possible benefits through structured deliberation. This enabled to construct a foundation from which actors mutually perceived the best direction moving forward and were encouraged to provide further ideas for development. Additionally, it created a sense of ownership towards the end-solution, as actors saw their direct contribution towards the redesigned service. It did not result in solving all key issues and differences, but it proved crucial in bringing actors together and in creating shared perceptions.

To foster additional mutual understanding and search for new ideas, the coordinating actor engaged partners in organising ad hoc, work visits to various organisations e.g. visits to the coordinating actor or to the Health and Welfare Information Systems Centre who introduced possible ICT solutions for the future phases.

The project manager of the Social Insurance Board brought new ideas of service design due to her background and exhibited initiative. She had a service design background and was not impeded by the historical legacy and routines of the organisation. She took up the stewardship role and provided the support for pushing through change within the Social Insurance Board and other organisations. This encouraged actors to interact in the new innovation programme. As she supported the use of new tools and embodied an alternative approach for inducing innovation, it enabled the project to be initiated despite the initial scepticism that established officials possessed due to past experience.

Actors were mostly successful in addressing the existing complexities, but some issues remained unsolved during the project. The Social Insurance Board was unsuccessful in engaging health care providers and municipalities at a meaningful level. The coordinating actor arranged meetings with representatives of the Family Physicians Association of Estonia for collecting new information, which in the end failed to further engage them in the project. This led to a lack of key information and additionally limited opportunities to further tailor the service towards user interests, as the two actors were unwilling to engage in the project and

make changes. The project was also affected by the regulatory environment. As it deals with sensitive personal data, the proactive service provision requires consent from users. Also, as the data usage related to the service is highly regulated, it creates difficulties in exchanging data between different organisations, which has specifically complicated collaboration between the municipalities and the Social Insurance Board.

Dynamics and activities in the innovation process

New ideas emerged directly from interactions between different organisations and individual actors who were actively encouraged to provide their perspective within the project framework. Each individual in the project team was encouraged to write down their ideas, which then were deliberated amongst all project team members in an effort to complement it or propose an alternative. The ideas proposed, were then prioritised according to importance, effect or feasibility. The deliberation was strongly shaped by the inclusion of the Estonian Chamber of Disabled People, who provided input from their systematic collection of feedback from the disabled community. The Estonian Chamber of Disabled People possessed extensive experience due to years of systemic accumulation of information and feedback from disabled people[19]. The Social Insurance Board possesses a monopoly in the delivery of key services to disabled people in the Estonian context, which gives them expert knowledge of existing processes and the necessary resources. Both the Social Insurance Board and the Estonian Chamber of Disabled People conducted interviews with the target group to enable an overview of the user perspective that was accommodated into the redesigning process, thus incorporating a user-oriented approach. The results were infused through a methodology using empathy cards (i.e. cards that represented the feelings of the respondents), which helped to make the mindset of the user the focus of the project.

[19] For instance, the Estonian Chamber of Disabled People has published guides and manuals that highlight crucial information for the disabled community and communication with the government. Different guidelines are gathered on the following website: https://www.epikoda.ee/mida-me-teeme/trukised. An example of such guidelines (which was linked to the processes that the collaboration in the current case tries to streamline) can be found here: https://epikoda.ee/media/pages/mida-me-teeme/trukised/478472131-1567066576/epik_kasiraamat_2019-est-koos-low.pdf

The project team made a conscientious decision to aim towards a positive mindset and arguments with negative undertone were disregarded, as they were perceived to be impeding the general innovation process. Overly conflictual ideas were postponed to later stages of the project to stimulate the speed within which the project was carried out. The coordinator mitigated this through promises to address the issues at later stages, when it is possible to accommodate with the timeframe. As a result, all the ideas that were incorporated were the compromises of different actors.

All actors agreed and relied on a compromise-based approach, as efforts were given into finding the key similarities between ideas. As actors approached the issue from different perspectives, it enabled the actors to better comprehend the environment. This was exhibited by the decision of the Social Insurance Board to redesign how the officials approach the user group in an effort to create a more empathic and understanding environment given the difficult situation of the parents. The issue was raised not only by the Chamber of Disabled People, but also by the national Unemployment Insurance Fund. However, the limited resources provided to the project team created pressures to prove the validity of the idea to provide them access to additional resources. This did result in the Social Insurance Board opting to disregard some ideas, which could be seen as opposing or conflicting with the general process.

The actors were open to change their initial ideas based on achieving a solution to the underlying problems. The orientation of the Social Insurance Board, the Estonian Chamber of Disabled People and other actors towards finding the proper solution enabled them to obtain a more holistic perspective, which influenced their initial ideas and approach. As the Social Insurance Board holds monopoly over most affected processes, the feasibility was evaluated from the standpoint of the coordinating actors, which did provide them with additional power to influence the direction of the collaboration. Feasibility remained a point of evaluation for the Social Insurance Board mainly, as other actors had limited impact on it, nor were they affected as much from changes. The Ministry of Social Affairs however had to evaluate the legal framework, which resulted in their cautious approach towards the project.

Strategies to achieve societal support for the innovation

The media had a strong role in highlighting societal issues for the disabled community creating the impetus for initiating change. This was mainly attained through news pieces and pressure from interest groups by highlighting the bureaucratic burden the parents of disabled children have been submitted to. Pressure has been longstanding and due to failure to address persistent problems in the field of social welfare, most initiatives are received with a level of scepticism from key actors in the field.

The project team has effectively managed to communicate the initiative and results to the top administrative leadership, who have voiced their support and encouraged further action. As the project is still at a relatively early phase, the information dissemination activities to the wider society have remained limited.

During the piloting phase, the communication with health care providers has positively affected the stance of actors within the health care sector. However, the effect was limited, as actors retain a critical opinion due to the problems with integrated service provision in the health care and social welfare sector.

The media was used by the Social Insurance Board to increase support for the solution during the piloting phase through several news pieces that have figured in several outlets, including a magazine oriented to social work. The news pieces relied on the feedback from users in the pilot, which was overwhelmingly positive, enabling the project team to gain more legitimacy. However, wider dissemination activities have remained limited, as the solution is still in the piloting phase.

User involvement

The Estonian Chamber of Disabled People was involved as a user representative organisation and has been a key actor within the field for a long time. Also, members of the target group were involved differently in different phases of the project. Initially in an effort to map user perspectives during the phase of problem analysis, several interviews were conducted with members of the target group. This enabled to better perceive the issues they face, thus

moving the focus from back-end perspective towards users. During the piloting phase, 50 children and their parents tested the new service process.

At the initiation, there was a certain level of scepticism from user representatives due to previous similar experiences where the input from user representatives had received little attention. This time, the incentives for participation for the users were linked to the opportunity for reduced administrative burden and an opportunity for a simplified application process. They were made aware of the possibilities of the project as they were contacted by the Social Insurance Board or the Estonian Chamber of Disabled People. The participation entailed limited burden and they were enabled an opportunity to provide feedback that was consistently taken into consideration. This was an effort to maximize their benefits for participation within the project.

The users were provided an arena in which they could contribute on a meaningful level in redesigning the approach of governmental actors. The Chamber for the Disabled People strongly highlighted the systemic issues, as years of collecting feedback had enabled them to create a comprehensive overview of the possible issues. They also provided legitimacy within the field and contacts with other actors. The interviews with users proved to be crucial in constructing a more user-friendly approach in terms of customer service. Users perceived a strong level of rigidity and an overly bureaucratic terminology when initiating the application process, which negatively affected their ability to make an informed decision.

Feedback has enabled the Social Insurance Board to shift towards a more emphatic role, which took the emotional distress into account and therefore tried to limit the burden on parents. This helped to adjust the initial idea and realize that the automation of the application process by itself would be insufficient to reduce the administrative burden for users. As the solution was initially strongly focused on innovation in back-end processes and because the field of social welfare and protection is an emotionally sensitive topic, it was very difficult to attain coherent feedback from the actors. The Social Insurance Board opted to use the emotional feedback to highlight the success of their project to reinsure actors regarding the validity of

the redesigned service. However, they did highlight that due to the positive nature of change, coherent feedback remains scarce, as users have opted for a general comparative stance and remain limited in providing feedback in possible issues with the redesigned service.

The user involvement during the project was highly successful, which was reflected in the feedback of the user representative organisations, who were positively surprised by the willingness of the Social Insurance Board to adjust their methods. It was additionally reflected in the feedback of the users, who were very positive during the pilot regarding the redesigned service and the limited amount of burden it puts on users. Users were treated and perceived as partners during the idea generation, which was reflected by how their feedback was taken into consideration. However, several participants perceived it necessary to expand upon the initiative with follow-ups that target a wider group of (potential) users.

Role of ICT in the collaboration process

The usage of ICT tools remained limited to basic tools within the collaborative arrangement. During the innovation process, the actors remained reliant on email for communication and Google Drive tools that were used to enhance the climate of innovative service-design, provided by the Government Office. The communication tools were used throughout the project and were crucial for ensuring interactions between relevant actors.

In addition, during the testing phase, the Social Insurance Board made use of Axure for formulating the initial prototype and used process modelling tools such as Bizagi to map the application process and to make corrections to it. Both tools expedited the necessary processes, as well as benefitted the visual representation to make it more comprehensible for both the partners and the involved users. Bizagi enabled a visually comprehensible process map that could be easily adjusted based on feedback of engaged actors. As such, Bizagi made formulating feedback more convenient, which also increased the impact of a diverse set of involved partners on the innovation (as they were now able to formulate their feedback, without needing the technical knowledge of the entire process). Through Axure, actors could design a prototype without needing too much resources or technical skills. This simplified the

work of the Social Insurance Board and made it easier to involve a broad set of actors (even those who did not have the technical knowledge required to develop prototypes).

Success factors

The innovation process strongly differs from traditional attempts to redesign a service as it emphasises user-centricity and pro-activity. The conscious approach to consistently deviate from organisation-centric mind-set and orient towards a user-oriented solution has resulted in stark differences with standard procedures. A user representative organisation was actively engaged as an equal partner in efforts to design a service that offered maximum benefits for the applicants.

It is necessary to consider the organisation-centric and siloed reform attempts within the Estonian public administrative structure, which enable the initiative to stand out in its effort to more actively engage different actors. The fragmentation within the public sector has resulted in isolated attempts to instil a more user-centric approach, which has faced inflexibility and resistance within the organisations.

Despite the ambitious approach by the relevant actors, the innovation and collaboration process did face several barriers. These were not predominantly the result of actors' attitudes or negative stances, but the result of limited available resources, which impeded their opportunity to participate to the extent desired. Duality of roles and competition between the Ministry of Social Affairs and Social Insurance Board between organising service provision in the field further complicated the process. Concurrently, there are separate initiatives within the field to bring about change in service provision for disabled children, which causes actors to distribute their resources. This inhibits the opportunity for actors to collaborate to the extent desired, as the limited resources for both NGO's and governmental actors results in individuals being overloaded with different tasks, which affects their ability to participate.

There were certain key factors which enabled success. The Social Insurance Board is in the middle of reforming outdated services as part of an organisation-wide initiative, which has enabled the agency to provide the necessary leadership support to accommodate the

changes. Additionally, it is important to highlight the role of the Government Office, who has been leading the innovation programme that enables different government actors to experiment with a novel service design framework. This has enabled the actors a framework within which to approach the collaboration process, which was very smooth considering all the different problems (e.g. limited resources, time, incompatibilities with the legal framework, etc.) that the participants faced. Individual actors were motivated to contribute additional resources to ensure the positive result from the collaborative arrangement. Another key success factor was the role of the project manager. She was not an established member within the Social Insurance Board due to which she was uninhibited by the established organisational legacies. As a result, she brought a mind-set to the project, which proved crucial in bringing about change, as she held an alternative perspective, which allowed for the reconstruction of the established work routines.

This project exhibits the importance of personal motivation, use of novel service design methods, openness towards change and importance of a strong project manager, which enabled the project to successfully reach this stage.

3.1.8. SAMPA (Spain)

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Introduction of the project

The **SAMPA project** [20] has been implemented at the outpatient pharmacy unit at the University Hospital Miguel Servet (HUMS) in order to improve adherence to treatment, efficiency in drug management, accessibility to the Outpatient Dispensing Unit and patient care, as well as reducing the error rate in the processes of medical prescription,

[20] "Service for registration and promotion of medication adherence in elderly patients and destined for the outpatient pharmacy unit at the University Hospital Miguel Servet" http://sectorzaragozados.salud.aragon.es/pags/668fa_cpi

pharmaceutical validation, dispensing and administration of medicines to outpatients. Most of these objectives could not have been achieved without the development of new technology to automate drug storage and dispensing and the digitalization of all processes, from prescriptions to checking adherence within the project of reforming the HUMS outpatient pharmacy unit.

Different innovations have been implemented: an electronic prescription platform (integrated with the health systems in use at the HUMS), a patient appointment system, a robot for automatic storage and dispensing in assisted and unassisted mode, a full traceability system for the entire drug management process, primary and secondary adherence records system, improvements to the website, an application (app) and a contact and information system in the dispensing area to facilitate communication with patients.

The project started in December 2016 and ends in December 2021. The conceptual part had two phases: initial design of the project by the HUMS (2 months) and the procurement process (5 months), where the HUMS made the request and Grifols and Dominion (private companies) designed their proposal. The testing and piloting began in the next phase (10 months), but the development of some parts of the innovation also continued. The next phase is monitoring and consolidation of the innovation (19 months). The final phase consisted of maintenance and private partner payments (24 months).

The project was both explorative and exploitative to some extent. The implementation of an automatic dispensing system and the patient appointment system are not new. However, the integration of all the systems and the quality of the service obtained was completely new. The project is more exploitative because it is embedded in a contract that establishes rigid deadlines and defines the structure of the innovation process

The eHealth innovation

The project involved the reform of the HUMS outpatient pharmacy unit. Physicians can prescribe medicines to their patients with an electronic assisted prescription system. This system provides recommendations, alerts about interactions between medicines and maximum doses, and information about the adherence of the patient to the treatment to

support the physicians' decisions. The pharmacist has the possibility of calling patients for consultations on particular subjects (e.g. to explain the use of medicines) and they can request a consultation by a pharmacy technician. Medicines (codified with a QR code) are delivered by a storage and dispensing robot that has reduced errors and the space and stock needed. The patient is called and receives the medicines much faster with the automatic dispensing system. This system allows complete traceability of the medicine, making this service safer for patients. The adherence of the patient to the treatment is controlled with an app that directly calculates adherence through dispensation and adherence surveys.

There is a lot of asymmetry in the assessment of these technologies by the interviewees, perhaps because of the different knowledge the interviewees have about them. These technologies have been used previously and are not rare, although this does not avoid difficulty in their development (e.g. the software developed). Some of the functionalities could have been developed with other technologies (e.g. the codification of medicines) but not others (e.g. the prescription system). The innovation is based on these technologies so their impact on the innovation is high.

Outpatients use this service because these medicines are not sold in pharmacies. These are high-risk medicines and are only provided by hospitals. The importance of this innovation is the improvement in the security of the whole process (prescription, storage and dispensing). This system also provides more time to pharmacists to explain the use of the medicine and deal with patients' questions. The innovation is fully implemented, and it is not necessary to make any further modifications, though it could be improved in the future.

The innovation is a success because it allows for a safer and faster service for patients, more information for physicians about adherence to medications, and reduces the cost of storage and dispensing. The innovation has an average level of innovativeness. In most cases, the innovations are improvements on previous technologies (e.g. electronic assisted prescription system). In other cases, like the app to monitor patients' adherence to the treatment, there is a higher level of innovativeness. The use of a robot for dispensing medicines has already been implemented in other health centres and pharmacies. However, the integration of all these

tools and improvements is completely new. The interviewees agree that users could not do exactly the same thing with other tools and it would be difficult to find other tools with the same functionalities. These tools will be used very frequently because they are integrated in the day-to-day work of the pharmacist and physicians in charge of outpatients. However, not all the users that could benefit from this innovation will be able to use it because its use does not cover all medicines.

The performance of this innovation is high because it achieves the project's objectives. The complete traceability, the automatic storage and dispensing system and the improvements in the prescription system reduce the errors in the process. The possibility for physicians and pharmacists to monitor the treatment improves the adherence of the patient to the treatment, according to the interviewees. The module for patient appointments and the automatic dispensing system reduce patients' waiting time.

Partnership structure, governance and resources

The HUMS had the knowledge and experience in healthcare, but they needed human and ICT resources to develop the innovation. The HUMS decided on a public procurement of innovation (PPI) to obtain these resources and it participated in the STOPandGO project[21]. Two Spanish companies, Grifols and Dominion, were selected to develop the innovation together with the HUMS.

There are three core partners: HUMS (the coordinator, it is the biggest public hospital in Aragón, Spain, and has all kinds of clinical and healthcare services), Grifols (a private partner, one of the biggest providers of medical and technological solutions in the healthcare sector), Dominion (a private partner, global provider of technological services and specialised engineering solutions). There are two other parties involved with less participation: the Chair of Strategy and Innovation in Public Procurement in the Healthcare Field at the University of Zaragoza, which collaborated at the beginning of the project for legal advice about PPI, and

[21] The PPI was part of the STOPandGO (Sustainable Technologies for Older People – Get Organised) project, a Public Procurement of Innovative Solutions Pilot project funded by the European Commission under the Seventh Framework Programme (http://stopandgoproject.eu/), but the STOPandGO project partners are not related to the SAMPA project innovation.

the Aragón Institute for Health Research, which facilitated collaboration in the STOPandGO project.

The most important resources were human resources, which were mainly provided by HUMS, except for ICT knowledge that was provided by Dominion and Grifols. The HUMS provided healthcare (mainly pharmacists) and technology professionals for integration of the innovation in the HUMS systems. Grifols and Dominion provided the technology professionals for development and the implementation of the technology. They also provided the ICT resources. Grifols provided the automated dispensing system and related software and Dominion provided the rest of the software needed for the innovation. The most important partner providing financial resources was the HUMS (it is part of SALUD, the healthcare system in Aragón, which provided the resources) and they also received funding from the STOPandGO project. The main process resource in this project was access to users (pharmacists, physicians and patients) and this was provided by the HUMS. Another process resource is legal knowledge, provided by the Chair of Strategy and Innovation in Public Procurement in the Healthcare Field at the University of Zaragoza and the Aragón Institute for Health Research.

The HUMS was the partner that required the collaboration of external parties to reform and improve its services, according to the objectives mentioned above. Moreover, it is the only partner that has access to patients and healthcare professionals. The inclusion of Grifols and Dominion was needed because they provided human and ICT resources to develop the innovation. Grifols is a HUMS supplier and has collaborated in other projects. These private partners are interested in the project because the change in the service to outpatients is an innovation that they can sell to other hospitals in the future and ISS Aragón supports innovation projects in the Aragón healthcare system. The collaboration between the HUMS and the Chair of Strategy and Innovation in Public Procurement in the Healthcare Field at the University of Zaragoza was direct and easy because the HUMS is a university hospital.

SAMPA is managed by a project team composed of personnel from the HUMS (the general manager, economic and maintenance managers, the heads of the pharmacy and outpatient units and technology professionals, although not all of their participation has been

continuous) and representatives from Dominion and Grifols. The project team is managed by the general manager and the head of the HUMS pharmacy service. The HUMS is the lead organisation in this partnership. The collaboration was requested, and the contract was drawn up by the HUMS. The HUMS has more power in decision-making and it has provided most of the financial and human resources. Because of the strong position of HUMS as a public procurer, the partnership can be characterized as a lead organization type of network (Provan and Kenis 2008).

Network management

There have not been any conflicting opinions about the definition of solutions in the project because they were well established in the contract. There were some differences about the scope of the innovation (e.g. level of traceability of drugs, the design of the app, the design of the automated dispensing system) and deadlines, but the partners communicated these differences and the coordinators sought how to harmonize these perspectives in the meetings. Little strategic behaviour was witnessed in the project because the partners' motivations were aligned with the purpose of the project. The partners needed technological knowledge (the software available at the beginning of the project was not enough) and legal knowledge (because of a change in the standards dealing with the codification and traceability of drugs), but no additional partners were added.

The partners tried to solve complexities by exploring the views of other partners and by connecting resources between partners. When complexities arose, the coordinators arranged the necessary meetings for all partners to present their views, and, with successive interactions, agreements were reached. The partners made some preparations for the meetings (e.g. pre-meeting reports, meeting agendas, presentations, reports to be delivered at the meetings). The general preparations were made by the coordinators and the relevant partners contributed with content.

Dynamics and activities in the innovation process

The initial idea was generated within the HUMS by interaction between the managers and the pharmacy service. Interaction between the private partners gave rise to new solutions (e.g.

an improvement on the measure of adherence in patients). According to one of the interviewees, these interactions were motivated by the creation of a joint venture between the private companies in this project.

The partners searched for similarities when there were different ideas. These differences arose in defining the desired capacity of the final service (e.g. number of patients, number of care posts according to the activity at the hospital, the expected growth in the number of patients) and some of the characteristics of the innovation (e.g. design of prescription management, dispensing and appointment modules). The partners focused on feasible ideas and the terms of the contract.

Strategies to achieve societal support for the innovation

This project received average societal support at the beginning, but this has increased during the project. Major politicians and other actors in the healthcare sector, such as the pharmacy and management community (e.g. the Spanish Pharmacy Society, the Catalan Society of Clinical Pharmacy; the Treatment Adherence Observatory group), are the most important providers of this support. The partners have carried out diffusion activities related to the project (e.g. an explanatory video about the project available on the Internet, presentations at conferences in the pharmaceutical and PPI fields). The support from the media was very limited (even non-existent) at the beginning of the project. The media provided some support during the project, when politicians visited the HUMS facilities.

User involvement

There were two types of users: patients (individuals and patient associations) and healthcare professionals (pharmacists and physicians). Users have knowledge about patients' needs, how the service works and its legal requirements. The innovation affects the day-to-day tasks of healthcare professionals working in the outpatient pharmacy unit and should be well integrated to be a success. Healthcare professionals are motivated to participate because they think that this innovation could improve the quality, security and quickness of the service. All users were informed about the project and the characteristics of the innovation.

Pharmacists were involved from the beginning of the project, being consulted about the pharmacy service, advising the partners and collaborating in the piloting phase. Physicians were consulted by the collaborating partners and they also collaborated in the piloting phase, but to a lesser extent. Patients were consulted about their needs (mainly the patient associations) and they participated in the piloting phase (e.g. they noted problems with the reading of health cards).

Users provided knowledge for the design and development of the innovation and feedback about user experience. Users' contributions were recorded in reports, noted in the proceedings and applied when feasible. The interviewees gave different opinions about the rigidity of the user participation process and some preferred more rigidity in the participation of pharmacists. However, all the interviewees noted that user participation has been a success and has fulfilled their expectations.

The participation of users in this project has been a success. No lack of information about the project and the characteristics of the innovation has been detected. Those users with most knowledge were involved from the beginning. The pharmacists interviewed noted that the communication and collaboration environment was an important factor for the success of their participation. However, the project could have made better use of user feedback if users had been involved before the agreement between the partners was signed. This could have helped to define the scope of the project more specifically by taking into account users' needs.

Role of ICT in the collaboration process

The ICTs used for the collaboration process are widely used: telephone calls, emails, and recorded presentations. The use of these tools has been systematic but not essential to support collaboration between partners in the innovation process. In order to facilitate user participation, explanatory videos were displayed in the waiting rooms. These technologies have increased patient convenience.

Success factors

The collaboration and innovation processes between partners have been smooth and there have not been any major conflicts or difficulties. The contract clearly established the purpose and participation of each partner, preventing strategic behaviour. There were some differences in the scope of some parts of the innovation, but the private partners were able to reach an agreement with the mediation of the coordinators and the increased interaction between partners in different meetings. The innovation process was also structured in the contract, which has helped to avoid the emergence of non-feasible ideas. However, the differences in the scope of the innovation and the rigid deadlines have caused some conflicts. In our view, a higher level of user participation to define the scope of the innovation before the contract was signed could have help to avoid these conflicts. Furthermore, they could have been avoided with more flexible deadlines in some parts of the project, especially if there was a need for modifications in the scope of the innovation.

The partners agree that the design of the contract was one of the success factors in this partnership. It was one of the first PPI contracts carried out by the HUMS, so there was no previous experience with them. The inclusion of other partners (even with a marginal participation in the project) with the legal knowledge for the design of the contract has been helpful to achieve a smooth collaboration process.

The use of ICT for the collaboration process and user involvement has been low and only general-purpose tools (such as phones and emails) have been used. However, the use of these basic tools, together with face-to-face meetings, has been enough in this project, as there have not been any important complaints regarding lack of communication or collaboration.

The participation of users has been a success because of their motivation to develop the innovation and communicate with the coordinator. The developed tools have changed the healthcare staff's daily work, solving some of the problems they face, and have improved the quality of services provided to outpatients. However, the early inclusion of patients (within the possibilities of their knowledge) in the design phase could have been useful to increase the performance of the innovation.

The most important lesson learnt concerns the advantages and disadvantages of preparing a good contract to establish the relations between partners to implement an innovation project. If the contract is well designed, it allows the end result to be on time and with less conflicts. However, it could limit partners' willingness to contribute new ideas to improve the solutions and make them more risk averse. In this project, this type of contractual relationship worked well because most of the innovations developed were not disruptive but were based on previous technologies that have now been improved and integrated to achieve something new. However, conflicts among partners have emerged when they have disagreed about the scope of the project.

3.1.9. PGO in de Regio (the Netherlands)

Erik-Hans Klijn and Vidar Stevens, Erasmus University of Rotterdam (EUR), the Netherlands

Introduction of the project

In 2018, The Lage land Hospital together with a number of partners started a project which was aimed to create a personal health environment for patients (PGO= Persoonlijke Gezondheids Omgeving) with better information exchange that would benefit patients. With a PGO, patients are able to access their medical data at one place and share and manage their data. In this way, both the patient and the health provider can see (changes in) the status of health and treatments. The project also aimed for achieving the MedMij (WithMe) certificate. MedMij is an organisation that develops a standard for data use for PGO. They develop rules and provide a certificate to organisations that match the standards and rules of their certificate.

The project is one of the four pilot projects The Lage land Hospital in Zoetermeer (province South Holland in The Netherlands) started in 2018 to achieve a more modern health care system and improve its hospital and the services. The core idea for these pilot projects is to create innovation by starting small and later upscaling the innovation. Thus, stimulating innovation by targeting efforts towards specific projects that help the hospital (and other care

and health organisations in the neighbourhood) in which experience can be gained with specific innovations. After learning from the test phase, the idea is then to upscale the innovation.

The Lage land hospital was in huge financial problems a few years earlier (about 2015) and had to make huge efforts on the one hand to improve its financial situation and on the other hand to modernize and enhance its service and its relationship with other health and care organisations to restore its reputation. The aim in the project was to solve the problem that patients had hardly any access to their medical data and history and that there is hardly any uniform way in which this data is stored and made accessible. To keep the project feasible, it initially started only with data from patients with diabetics and COPD (Chronic Obstructive Pulmonary Disease).

Thus, the initial objectives of the projects were to 1) increase self-management regarding medical services, 2) to create a platform to exchange medical data, and 3) to pilot-test this new medical service in collaboration with professionals outside the hospital. The pilot testing was necessary because implementing such a system (and thus the medical services for patients) needed co-production of the hospital with first health care providers (like general practitioners, physiotherapists, etc.), the municipality, cloak caregivers (*mantelzorgers*), etc. These objectives did not change throughout the project.

The project started in 2018 and is still ongoing (during 2019 but also after that). Between January 2018 and March 2019, the involved stakeholders mainly focused on generating ideas. From March 2019 until July 2019, the parties made contract-agreements. After these contracts were settled, the stakeholder moved on with product development between July and September 2019. The pilot testing was initiated between September and November 2019. During this testing phase, patients, professionals and neighbourhood nurses were invited to review the project. This was done by organizing focus groups with professionals who would give comments on the ideas and possible implementation. They resolved minor user issues. However, this pilot-testing did not lead to any major changes.

The project can be characterized as explorative. It searched for new ideas, and creative solutions to enhance medical services. This outcome was determined at the very start of the project. There was room for trial and error, since the steering committees and directing stakeholders used an incremental style to learn from mistakes. This learning-process provided room for involved actors to mention occurring errors, so that the transition teams could fix these problems. In that sense, error and problems were openly discussed between participating-actors.

The project, however, was also directed towards timely implementation of its goals. The stakeholders received a significant amount of funding and subsidies from public actors and in order to maintain these funds, the involved actors promised to adhere to deadlines that were made in collaboration. Thus, the need to structure the process and keep it on time and closely connected to the core decision makers in the organisations (the director's platform). Thus, the whole process was tightly arranged.

The eHealth innovation

The communication and overall interaction between users and health care providers was very useful for patients, because this e-health platform provides an interactive communication between the patient and professional. Users regain control and access their own health services. This helps professionals to provide the best medical care for patients, which aligns with interprofessional collaboration-methods. The personal health data is collected, stored and communicated between relevant stakeholders in such way that all users would benefit from this innovation, because it provides the possibility to link different data registrations systems. The ICT technique was essential to realize this PGO system. But the ICT technique is not enormously innovative if you look at most of the answers of the respondents. Although the ICT technique itself is of course very important for the project and PGO as idea is very reliable on ICT to succeed. This is also what most respondents agree to.

Most respondents do think the PGO arrangement will be used a lot. And the system was online working by October 2019 which was on schedule. But of course the development will be

ongoing the coming time and has to enrolled out much more than this pilot project for a limited number of patients and a limited number of diseases.

Partnership structure, governance and resources

The collaboration had a network like character not only because a fairly large number of actors were involved in the collaboration but also because most decision making was jointly made. First of all, two public actors were involved, namely the municipality of Zoetemeer and Hospital (Lage Land). But there were also several private actors involved:

- Fundiz (a network organisation of care providers who also had an innovation fund. https://www.fundis.nl/). There were also member organisations of Fundiz in Zoetermeer involved in the project
- Two health care insurance companies CZ and Menzis and core/leading partners,
- IVIDO, a private company, which functioned as the interacting healthcare platform. Their PGO software received the MedMij certificate in June 2019, which was one of the reasons for their involvement.
- SGZ (Stichting Gezondheidszorg Zoetermeer), a joint foundation of primary care organisations in Zoetermeer
- and MedMij as user organisation (platform to connect patients to professionals).

The various actors contributed different important resources to the project. Human resources (mainly knowledge) were mainly delivered by Fundiz, SGZ and the Lage land Hospital. These actors also guided the process and developed partnerships between each other. It was essential for the results of the project that these actors remained active during the partnership (which still is functioning). The insurance companies (i.e. CZ, and Menzis) and other public actors (e.g. the municipality) brought in financial support to achieve the organisational goals. ICT support was delivered by IVIDO. It could have been done by a different private company, but IVIDO was hired mainly because they had a good reputation and had much experience in this area (they also had a MedMij certificate). IVIDO wrote the software for the platform and brought in knowledge about how to organize such a transition as smoothly as possible.

There were several external environmental pressures to initiate this project. The sector is pressured to renew and personalise medical services. But the sector is also pressured to organize health care as little as possible in hospitals and more in cheaper health care institutions at lower level (e.g. general practitioner). This led to a transition towards self-

management with more services at home and less medical services in hospitals. This project fits in that general policy idea and the necessary transition that is involved in this is also laid down in a national policy document/agreement between a wide array of involved stakeholders in health. The document was signed by the partners in the beginning of 2018 and called 'Hoofdlijnenakkoord Medisch Specialistenzorg'. Thus, there was also a certain top-down (external societal and governmental) pressure to achieve this interactive platform. Most partners were also highly motivated and interested to collaborate because they all had to cope with a transforming society as (public) health care providers. The partnership was keen to explore the opportunities from this innovation to make their own organisations more future proof and to have an influence on how in general eHealth platforms will organize and control personal medical information from their clients and patients.

The Lage land hospital has several additional strong motives besides the general (political) pressures describes above. It had a bad reputation before 2016 (financial problems and low valued services) and used its financial problems and difficult position to 're-invent' itself and look and implement innovations that would also enhance the reputation and position of the hospital. Thus, for Lage land the motives were also strongly institutional (enhancing quality of care and improving its financial situation). For the other partners, the motives for SGZ were clear and easy. Through the project they could contribute to patients' self-steering and governing and they can improve on data coordination which is a strong demand of health care organisations (both politically and from society and patient organisations). The motives of IVIDO were related to selling their product/services and the pilot gave them the opportunity to develop their skills further. For the insurance companies, the project was simply a core business and involving with a pilot gave them valuable information about possibilities and pitfalls in providing patients with more data to use.

Thus, summarized the main motives for the involved actors were:

- Hospital Lange land was strongly inspired by as mentioned to enhance their service, but also to enhance their image which had been damaged by the financial problems.
- The motive of the municipality is more to enhance health care for its inhabitants

- Fundis: fundis has member organisations in Zoetermeer involved in the project and is also highly interested in health care innovations. So, their motives are both concern for their members and wish to be involved in and get expertise in innovations in GPO
- Two health care insurance companies CZ and Menzis are given their task constantly looking for innovations that can make health care cheaper and more efficient. And of course they signed the national agreement (see earlier text) and this project enables them to tell that they are working on that agreement,
- IVIDO: can sell services and develop them. So, they have a commercial interest. Respondents indicated that they are aware of that so INVIDO was not present at the arenas where decisions were made to avoid conflicts of interests,
- SGZ: is also interested in any innovation that increases their responsibility and make their job easier. The GPO idea should make both registration easier and improve care to patients. And of course they are strongly involved in implementation, so it is important for them to be involved and be able to adapt the innovation in the GPO
- MedMij wants to increase the number of organisations that use their standard (and thus are keen to be involved in various pilot projects) and also are interested in piloting GPO systems so that they receive more knowledge about possibilities and pitfalls.

The formal collaboration that was used for this project used three organisational arrangements to organize the various actors involved: director's tables (where the leading managers of the organisations involved had contact), transition teams (or steering teams, where the coordinators and managers would meet each other) and local working groups (project teams). The organisations in the various organisational arrangements were:

- Project team: SGZ, Fundis, Lange land Ziekenhuis
- Steering team: SGZ, Fundis, Langeland Ziekenhuis
- Director's table – to discuss progress on the highest level (CEO's): SGZ, Fundis, Langeland Ziekenhuis. The director's table was added to involve the management of the organisations in the innovation process and to able to take quick decisions by the most important involved directors.

The various networks between professional healthcare provides, the municipality and the ICT-provider focused on joint decision-making throughout the transition-process. Some of these partners then had employees who further represented and specified the project-goals from the coordinating/core partners, in designing and implementation-teams. To explore ideas, it was important that data- and knowledge were shared between the participating actors. Thus, there were a few leading actors that made the most important decision: SGZ, Fundis and Lage land Hospital. They were in charge of the joint decision-making process. Overall, the network was self-governed (Provan and Kenis 2008). The organisational arrangements mentioned above were installed to enhance coordination and joint decision making. There was an equal

delegation of powers to all members and decisions were made collectively. The level of interaction was high, just like the trust and consensus of goals between the members.

Dynamics and activities in the innovation process

Ideas were generated via interactions between individuals. One of the difficulties encountered was to integrate the ICT platform in the existing environment within the timeframe that was scheduled for this project. Other partners and professionals outside the hospital and partnership encountered the same problems, which were revolving around a lack of data. By combining these fragments of information, it became possible to investigate the full lifestyle of patient from many perspectives with different insights from multiple experts. For most implementing actors, this had to be undertaken besides the normal workload (which is usually high in health care) and this was mentioned as a difficulty. So various respondents indicated that active process management by the coordinators and other 'boundary spanners' in the organisation were very important to keep the process going.

The implementation phase was mainly guided and implemented by managers and professionals from Fundis, SGZ and the Lange land Hospital. Currently, the actors are actively involved with finding solutions for upscaling opportunities. There were some regulatory restraints in terms of legislation to initiate the program (GDPR related issues).

Network management

During the process, there were no major conflicts between participating actors. This led to an open attitude in which information between actors was shared and issues were mentioned. This caused that during the contract negotiations the three coordinating actors were in general fairly open about what they wanted to achieve. This was stimulated through numerous meetings in which the core partners met almost monthly and the teams weekly and in which in general the actors made sure that each and every one was heard, and that different perspectives were integrated in the project. This was relevant in order to achieve a synergetic process.

Whenever a conflict occurred, this was seen as an opportunity by the partners to enhance the quality of the project, respondents indicated. To align the decision-making process and process rules, the participating actors agreed together on 'unanimity voting'. This led to a shared understanding (and a necessity to come to an agreement in case of conflicts) in terms of process-development among stakeholders. Furthermore, the participating actors were stimulated to discover alternative solutions. To achieve this, they visited various facilities in the Netherlands that also experimented with similar projects. They then asked these third parties (transition coaches and a professor from the University of Leiden specialized in eHealth application) for help and best-practices to enact a successful transition. Additionally, the partners could rely on the focus group to provide them with feedback from users.

Thus, actors tried to manage the process in several ways:

- The organisational arrangements (project team, directors table etc.) provided the actors with a platform to interact and connect to each other
- Rules for interaction (like the unanimity rule) provided solid ground for interactions between the actors and grounded expectations for the actors of each other
- Intensive interactions had to secure that the process proceeded, and everyone was connected to the project
- New ideas were inserted for introduced by planned visits to other facilities to learn from other experiences and by asking for advice from transition coaches and a professor from Leiden.

The 'unanimity voting' procedure, guided the process in such way that all stakeholders had to agree upon the development of the project. This caused a shared understanding. Moreover, the parties tried to connect with each other through enough time and room for discussing to align various opinion with each other (connecting strategy).

User involvement

User involvement was an important element in the process. Patients, MedMij and professionals were involved users. They were 'active' during the pilot-testing phase of the project. The professionals were included in a focus group in which various professional were

represented and they could look at and comment on both the development and implementation during the process.

The reason for involving users in the project, was the importance of the feedback of the users for the development of the tool, since in the end they have to use it and have to indicate what problems they encountered or expect to encounter. Some of these respondents also mentioned that user involvement is more important in signalling problems than finding solutions. Solutions are also a technical matter which needs experts. These solutions have to be tested, which is again an important moment to involve users. Thus, users provided feedback which was exploited by the partners to enhance the platform. Moreover, users were fully aware what was going to happen with their input, which ensured a fully transparent process of user involvement. Also, the level of commitment was high and there was enough time scheduled (multiple meetings) to investigate user-knowledge and experiences and to test the innovation.

Success factors

If we summarize the main lessons learned, these could be summarized in a few points: the user involvement, the overall organisation of the process and the learning that took place.

- Users had room for input, so that the partnership could learn from mistakes and improve the project. This was done via the knowledge, user-experience and new perspectives (also on legal terrains) from users. Various factors caused this success: All health professionals were organized in one organisation (1), there was good communication- and expectation management to involve users in the project (2) and the high numbers of users that participated show its success (3). Around 40 users were involved and committed to help with the pilot-testing phase.
- The partnership had committed and participating stakeholders who collaboratively worked on the innovation and cordially invited users to share their knowledge and experiences towards the project. This led to a successful and smooth implementation of the project, which is still ongoing.
- Intensive process management and intensive connections made between partners

3.2. *Collaborative eHealth innovation to create telehealth and mobile health tools and smart devices*

3.2.1. Mobile health technology for women with osteoporosis (Denmark)

Lena Brogaard, Roskilde University (RUC), Denmark

Introduction of the project

The purpose of Mobile health technology for women with osteoporosis (hereafter dubbed the osteoporosis app) was to develop a mobile application that could help patients process their results from bone scans and promote patient self-care and empowerment. Osteoporosis is a chronic condition, where the bone mass/density deteriorates to such a degree that it increases the risk of fractures. It is diagnosed based through a bone scan with which the mineral content and density of the bones are measured (Patient@home, 2012).

As women are especially prone to this condition after climacteric, the project focused on developing a health offer to women between 50 and 65 years of age whom are diagnosed with osteoporosis, and which can help them deal with the diagnosis process and time in between scans (Patient@home, 2012). There was no similar offer at the time, which was the key motivation for the partnership.

Based on the objectives and the particular participatory design of the project (described below), the project is characterized as explorative. There was a structured process with certain phases, so the overall process was not highly flexible. However, the purpose was to come up with new ideas based on user input and needs, and the process was very creative, e.g. using workshops and role play to come up with new solutions, constantly focusing on developing an offer that best meets the needs of the target group.

The project started in 2015 and was completed in 2018. It was based on a specific approach called "participatory design", which entailed three main phases and a potential implementation phase.

1. The first phase identified the needs of the women by interviewing them about their experiences, through observational studies and existing research. Besides the women diagnosed with osteoporosis, the project also identified and included other key stakeholders such as general practitioners, experts in osteoporosis, health professionals that work with this patient group and the Danish Association against Osteoporosis.
2. The second phase focused on designing and developing a prototype of the mobile application that addressed the needs identified in the first phase.
3. In the third phase, the prototype was tested in the closed environment where it was developed (the Osteoporosis clinic at Odense University Hospital).
4. In an additional fourth phase, the developed app was implemented and included in a digital patient platform which the hospital was already using.

An example of the user-centred and explorative approach was that the business that was originally involved, was replaced due to a change in scope of the project resulting from user input. The first business was interested in developing a health and fitness app, but it turned out that this solution did not reflect the needs of the patients, which were much more focused on getting evidence-based help in processing and dealing with the diagnosis in their everyday life. A new business was involved instead to create the final result: a mobile app that conveys the results of the bone scans through customized, evidence-based information about the condition (depending on the results of the scan) and provides advice on a calcium-rich diet and other important health-related information on how to treat the condition.

The eHealth innovation

The partnership resulted in a mobile application that can be reached through an existing patient platform used by OUH, which makes it possible for patients to access information about their health. Specifically, patients that go through a bone scan due to suspicion of osteoporosis are asked if they would like to get the results of the scan through the app. If they accept, the bio analyst that performed the scan enters the result (a t-score). Depending on whether the result indicates osteoporosis and to what degree, the app automatically shows the patient relevant information that pertains to that specific score/severity of the diagnosis.

The purpose is to help the patient understand what the conditions mean for them, before they visit their general practitioner for a final diagnosis. It is important because it provides them with evidence-based, targeted information so that they do not have to browse the internet themselves and risk reading incorrect and/or irrelevant information. The app also provides dietary advice, training videos, a calcium calculator and other features that can help the women treat their condition on a daily basis. There is no other known app on the market that provides this kind of "information translation" in the field of osteoporosis, and perhaps neither in related fields, which makes it a relatively radical innovation.

The app is fully implemented at the osteoporosis clinic at OUH but has not yet been implemented at other hospitals in Denmark, among other things due to a lack of national guidelines in the area of osteoporosis. This might be changing soon, as the app is starting to gain national political attention according to a follow-up conversation with the project coordinator. Moreover, it is for now only a segment of the osteoporosis patient group that benefits from the app. The reason for this is that only patients with a single condition (i.e. osteoporosis), where there is not a risk of multiple diagnosis or causes of the deterioration in the bone density and minerals, are offered to use the app. Elderly patients who are less comfortable with technology, also do not use it as much. The partners are working on expanding the use of the app to a larger patient group, which means that the app is still undergoing modifications, which will take some time. Nonetheless, the app does address the specified problems mentioned in the beginning of this report, as it provides a health offer to women with osteoporosis between the age of 50 and 65.

Partnership structure, governance and resources

The project was a part of a larger innovation effort called Patient@home. However, the project was its own separate process and the overall framework of Patient@home was hardly mentioned by any of the interviewed parties and will not be given more attention here. Moreover, the partnership was completed as a PhD research project. It thus did not have a steering group per se, but there was a team of advisors overseeing decisions made in the project, which consisted of a professor (the public partner representative) from Odense

University Hospital (hereafter: OUH), a doctor from the osteoporosis clinic at OUH, a general practitioner and an engineer from Southern University of Denmark (hereafter: SDU).

The project team represented the core actors, which consisted of bio analysts from the osteoporosis clinic at OUH, the involved business Medware (which replaced the first business) and the Association against Osteoporosis. The coordinator was the PhD-student in charge of the project at OUH and this PhD candidate facilitated the link between the two levels, ensuring that the advisory team was informed of the progress and key decisions. The management of the project is best characterized as a 'lead organisation' (Provan and Kenis 2008); the coordinator represents a participating organisation in the partnership, while also having a designated leadership role with enough resources and legitimacy to manage the partners.

All participating actors were carefully chosen to represent different types of resources:

- A professor and public partner representative from OUH made sure that necessary financial resources were in place for the project (including payment to the business) and supervised the PhD student. She is also an expert on participatory design and could thus provide knowledge and expertise on this approach.
- A professor from SDU provided human resources in terms of knowledge of the scientific evidence on osteoporosis and helped develop a risk-calculator for the app in collaboration with the business.
- The business Medware provided human resources, i.e. technological knowledge and competencies to develop the app.
- The association against osteoporosis provided human resources as well with years of experience in what types of questions patients ask, what they need, what a suitable diet for the patient group would be, and they also help create a calcium calculator for the app.
- The coordinator provided process resources, as she ensured progress, facilitated communication, identified key stakeholders, etc.

The professors were motivated because of their academic professions and thus had an interest in either the participatory design or the clinical perspective. The involved health staff was motivated to participate, as they could see that there was a need for providing better services to this particular patient group to help them deal with the condition at home (since the patients are not sick in a way that requires a hospitalization).

Network management

The collaborative process was generally without conflicts except for one, which resulted in termination of the contract with the first business that was involved in the project. This firm was replaced with Medware (the interviewed business). The first involved business was characterized as having a sales approach rather than a collaborative approach. They pitched ideas and products rather than listen to the needs of the users and public partners, which meant that they could not deliver an appropriate solution.

The collaborative process with the second business was very different, as the interests and goals of the involved public partners, private partners and users were aligned. They listened to each other, focused on addressing user needs rather than creating a commercial product. So while the first part of the project and the termination of the collaboration with the first business can be characterized as a connecting strategy, the collaboration was generally influenced by an exploring strategy; seeking goal consensus, variation in the innovative solution, finding information and key stakeholders, encouraging creative competition through workshops, etc. (Klijn et al., 2010).

Dynamics and activities in the innovation process

The idea of creating an app for women with osteoporosis was originally brought into the project by the first involved business, who was in the market for fitness and training apps. They saw the opportunity to create such an app for this particular patient group and reached out to the public partner and the coordinator of the project, who at that time was starting the project. However, the public partner and coordinator insisted on not determining the outcome (i.e. a training and fitness app) from the beginning because the solution had to be user-driven.

The innovation process was in general very much focused on creating ideas through interaction between public partners, private partners and users, as described in relation to the phases and specific participatory design used in this project. This was especially the case in the second phase where all parties participated in workshops. It was to some extent based

on input from these workshops, e.g. what type of knowledge and information the patients' need, as well as separate meetings with the different involved parties (such as bio analysts from OUH) that the prototype for the app was developed.

Throughout the project, there was a strong focus on implementation in that the coordinator herself was motivated by creating a solution that would make a difference in practice, that it had to be put to use. This motivation was transmitted to the other involved parties as well.

It is not the impression of the researcher that anyone was trying to push ideas through or that there was a need for compromise as the development was based on user needs. It was, however, mentioned in interviews that the business had an interest in creating an app that could be implemented into the existing digital patient platform used at the hospital (and at other hospitals in the region) to gain a broader use and sales potential. This also became the result. However, the coordinator had originally wished for the app to be separated from the digital patient platform in order to make it easier for patients to download and use the app without having to go through the patient platform.

Strategies to achieve societal support for the innovation

The coordinator tried to involve the general practitioners in the project as they are the ones who diagnose the patients with osteoporosis based on the bone scan results. However, they were not interested in or supportive of developing an app for that specific patient group, they wanted something that could be used more generally.

There was not a strategic focus on involving national or regional politicians during the project. However, after completing the project it has come to the attention of these politicians with the Minister of Health and the regional health council of politicians showing an interest. The app might become a part of a national plan in the field of osteoporosis. The coordinator also mentioned that the National Health Agency should have been involved to increase the chance of national implementation. When the osteoporosis project started, the agency was debating the need for new national guidelines on treating osteoporosis, but it was difficult to get them on board of something that was initially a quite small research project.

There was some attention from the media concerning the project. At the beginning, the partners had to contact the media themselves, but as the project progressed, they were contacted more by local and national news media, and especially by news outlets within the field of osteoporosis. This has perhaps helped the project gain more national recognition after completion and could lead to innovation dissemination, although at this point, this is only speculation based on the emerging interest among national and regional politicians.

User involvement

The involved users represented both clinical staff (bio analysts and doctors from the Osteoporosis Clinic at OUH), general practitioners and patients/citizens diagnosed with osteoporosis. Moreover, the Association against Osteoporosis was involved in the project as a user representative. The users were overall involved throughout the project (2015-2018) from idea development and selection to testing and implementing the mobile application, although additional users were involved in the implementation and testing phase. For instance, while one bio analyst was involved from the beginning, the rest of the bio analysts at the Osteoporosis Clinic were not involved until the testing and implementation phase.

The entire project was based on the participatory design approach, which means that the core motivation and point of departure for developing new solutions were the user needs. Hence, involving users was crucial to the process of developing a technological solution that will actually be relevant to and be used by the patients and clinical staff. For the patients and clinical staff themselves, the motivation was the original absence of health offers for this patient group. Unlike other chronic and widespread diagnoses such as diabetes, osteoporosis had never gained the same degree of attention. Especially the patients were very interested in developing a solution that could provide them with much needed knowledge about their own condition and how to actively deal with it without having to search for potentially unreliable information online. This project was their chance to actually achieve this goal.

The users brought in different types of knowledge, requests and levels of support. While general practitioners were less supportive of developing the solution, because they were not

interested in having an app for just one group of patients, bio analysts, patients and doctors from the osteoporosis clinic were very supportive of this project. The patients were keen on sharing their experiences and expressing what type of help or solution they would like. However, this varied amongst the involved users. While some patients were focused on empowerment (i.e. gaining knowledge to help them deal with the condition themselves), others were more focused on what the doctors could do differently to help.

The public and private partners and the coordinator facilitated this process of different requests and levels of support by helping the users view it more thematically and seeing the similarities in their needs. They would also have separate meetings with the different types of users to gain more specific inputs for different parts of the app. Both the interviewed patient, the bio analyst and the user organisation expressed that they could recognize their input in the final app, demonstrating how the partners had managed to incorporate the user feedback and requests into a coherent solution.

From the researcher's perspective, the user involvement was highly successful in this project. It was the point of departure for almost everything and a lot of time was spent on identifying and including relevant stakeholders, which resulted in a useful mobile application that is now implemented. The coordinator was generally perceived as a great process facilitator, whom was praised for including the users and listening to their needs. The same can be said about the private partner.

Role of ICT in the collaboration process

There was not a strong focus on ICT in the collaborative process, but the involved business(es) introduced somewhat advanced ICT to help facilitate the collaboration. The first business that was involved, arranged with the coordinator to use Scrum as a common communication and planning tool. They did not really get started much on this, as the business was replaced.

The second business provided the coordinator/public partner with access to the backend of their programming system. This way, she could easily go in and upload videos and text (e.g. description of user profiles) for the app, thereby facilitating a smoother collaborative process.

Hence, the coordinator did not have to wait for the business to take care of the content in the app. The partnership also used basic ICT such as e-mail and file sharing through Dropbox. They did not use ICT to involve users, since the partners interacted with the users in person.

Success factors

The impression of the researcher is that there are a few key drivers that especially contributed to the success of this project. First, the project coordinator was very adept at facilitating a smooth process and was complimented in all interviews with partners and users for being inclusive but also efficient. She seems to have been an important driver. It was also her PhD project, which gave her a clear incentive to create the best possible project.

Second, the user aspect was crucial. The project was very much focused on involving users, as both clinical staff and patients were needed to ensure that the solution would be relevant, useful and thus have a higher likelihood of being implemented. The coordinator emphasized that while she did not know what the final outcome would be when she started the project, her focus and main motivation was that the solution had to make a difference in practice.

Finally, the change in involved businesses made a big difference. The first business was considered too profit-oriented rather than collaborative, whereas the second business had experience working with people in the healthcare sector, they were local (which makes it easier to meet in person) and were much more attuned to the needs of the users rather than selling a product.

3.2.2. Burenondersteuning (Belgium)

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Introduction of the project

The project 'Burenondersteuning'[22] was a collaboration between different cities and private partners to develop a system that connects neighbours to help each other with small tasks and to remedy loneliness. The project had several objectives. First, the project wanted to tackle loneliness among citizens by providing a network of neighbours with whom citizens could interact. Second, the network of neighbours would also provide assistance in carrying out small tasks (e.g. taking out the garbage, helping in the garden, etc.). Third, the detection of the availability of neighbours would be implemented through Internet of Things (IoT) technologies. Through sensors that were connected to the internet, the network would be able to detect when someone had some free time, without that person needing to indicate that he was available. The project was financed with a grant from the Flemish government (Agency for Innovation and Entrepreneurship, Vlaio), 'City of Things', that covered 80% of the expenses of the project. 20% of the expenses was financed by the municipalities themselves. The city of Aalst, the city of Dendermonde and the inter-municipal collaboration in the region 'MidWest' (DVV Midwest) were selected by Vlaio to implement their project with the grant. They had one year to do this.

The project was carried-out through four separate phases. In the first phase (October 2018), the project was initiated and the steering committee had their first meeting. In the second phase (December 2018), the procurement process was conducted and Give a Day (a private partner and ICT-developer) won the tender. The tender concerned the development of a matching platform with which citizens could communicate with helpers. MonkeyShot (a second private partners and consultancy firm) got involved in the project because of the need for technical solutions for citizens who were not able to connect through the platform themselves (IoT for these people). In the third phase (January 2019), the idea generation of

[22] 'Neighbourhood support' (free translation)

the project started. There were surveys with citizens about the IoT technologies with MonkeyShot and a deeper analysis about the needs of the citizens with a focus group (Give a Day) and interviews (MonkeyShot). There were also interviews with health care providers. The city of Aalst (which was the main public actor in the project) sought ways to meet the needs of the citizens using IoT. They contacted IMEC, a globally renowned research centre, to learn about a similar project in Ghent (Hello Jenny). Using this data, the project group drafted a document with needs and values, on which the actual ideation was based.

These ideas were validated in co-creation sessions (April 2019). At this stage, the project changed. From the co-creation sessions, the insight grew that IoT was not the solution for the problem. The problem that needed to be tackled first was the increase in network capacity of people with care needs (they were not optimally connected to other people that might provide help). In the fourth phase, the solution was implemented in a test environment. There was now a strong focus on the 'neighbourhood bell' (using the phones of people instead of IoT) and the original matching platform. In the fifth phase (November 2019), the technologies were tested with 43 people. There were experiments with digital and non-digital profiles for the matchmaker and with phone communication and call flows in the neighbourhood bell. The technologies were not fully implemented (this was also not the objective of the City of Things grant of the Flemish government).

The project had characteristics of both an explorative innovation process and an exploitative innovation process. From the viewpoints of the city of Aalst, there was a lot of experimentation, creative discovery and trial-and-error in the project. There are multiple examples of this, for instance the change in focus from IoT to phone technology due to feedback of the involved users, testing out new things such as Hello Jenny (IMEC) with the users, creative discovery through project meetings, focus groups and co-creation sessions, etc. However, the platform (neighbourhood matcher) that was tested, had a lot of similarities with the matching platform Give a Day already created in the years before the project. The matching platform was therefore predominantly refined to apply to the specific needs of the users. Additional technologies were brought in (e.g. the phone call flow), but the core of the

matching platform did not change. Additionally, Vlaio imposed strict deadlines on the City of Things projects. This did not allow the partners to experiment and test the solution for an appropriate length of time.

The eHealth innovation

The innovation is an online matching platform and a call flow that is connected to the matching platform. Users can be called if they want to participate. They can be matched to other users and they can be called for certain questions and care giving of other users. The innovation creates essentially a virtual network between users and also incorporates people who have no access to digital tools (e.g. smartphone), by using a phone call flow that redirects them to the proper receivers. There are digital and non-digital profiles on the website of the matching platform. Since the matching platform is linked to phone technology, mobile devices (such as smartphones) can be used to become connected to the tool. Furthermore, information that is visible on the website of the matching platform when people are matched, is aimed at increasing the wellbeing of these people. Through the matching platform, the users can provide health and social care to each other. The tool is not fully implemented yet. It has been tested, but it is not implemented in Aalst yet. Furthermore, not all of its functionalities were tested by users. The users could only make use of the matching platform, not of the call flow. There were also some technical difficulties with the matching platform. This made it impossible to use the tool to its full extent.

When we look at the newness and impact of the functionalities that are created by the tool, we can confirm that these functionalities are quite new. There are similar tools that match people with each other, but none is focused at connecting neighbours or specific high-risk target groups (such as elderly people). This makes the functionalities quite novel. The impact however remains to be seen. Since the call flow was not tested, it is unsure if users who do not have digital means at their disposal (essentially a computer and internet connection) will be able to use the tool. Because of the technical difficulties that users experienced when using the tool in the test phase, chances are that even the users who have those digital means will have problems using the tool. In theory however, everyone who wants to connect to the

matching platform should be able to do so (even if they do not have digital means). This makes the theoretical impact of the innovation quite high. Moreover, the impact on a user's life might be quite extensive because of the fact that the matching platform builds social networks.

From a technological side however, the innovation is not very sophisticated. The technical complexity is low; there are no new technological components used in the innovation and the components that are used are not combined with each other in a new and advanced way. The only new feature of the technological recombination is the inclusion of phone technology in the innovation. Although the phone technology is not new, the inclusion in the matching platform is and it changes our thinking about how people can connect with each other through 'non-digital' means (phone), supported by a digital platform (matching platform). It also makes the usability of combining different communication channels, all connected to the same platform visible.

Partnership structure, governance and resources

Several partners were involved in the project. The lead partner of the project was the city of Aalst. The two other local governments (Dendermonde and DVV MidWest), were – along with Aalst – part of the steering committee of the project. Aalst created an additional project team to work out and follow up the project for the city of Aalst itself. There was one full-time equivalent (FTE) assigned to this project. This was different in the other municipalities. Both local governments did not have the capacity to be thoroughly involved in the project, which meant that in practice, most of the project was conducted by Aalst. Aalst worked together with two other, private partners: Give a Day and MonkeyShot. Both were consultants with experience in matching systems for citizens, methodologies to involve users in service implementation projects and IoT technologies.

The project also had a guidance committee, which was established to advise and guide the steering committee and project team. Other municipal actors (e.g. VVSG, city of Turnhout, Bruges, Ghent, etc.) and experts (e.g. Innovage) were part of this guidance committee. The guidance committee later became part of the steering committee. The steering committee

was the body that made important decisions about the direction of the project. All three of the involved local governments and Vlaio were part of this steering committee. The actual work was conducted in the project team of the city of Aalst, where Aalst, Give a Day and MonkeyShot were a part of. These partners can be viewed as the core partners of the project, with Aalst as the coordinating actor. The private partners had a contract with the city of Aalst that described what they had to accomplish. Due to the close collaboration with potential users of the application, the users can also be considered as partners in the project.

Each of these partners added particular resources to the project. For instance, the financial resources came from Vlaio and the three local governments, but the ICT expertise came primarily from the private partners (Give a Day and MonkeyShot). Other knowledge (such as how citizens could be involved in the project) was shared amongst several of the actors (Aalst, MonkeyShot, Give a Day). ICT hard- and software was especially introduced by Give a Day, while the more process-oriented resources (e.g. contract and network management), were brought in by Aalst. The involved users were important for their feedback and also for their experiences with working with similar solutions, which gave the core partners more direction in their pursuit for a performant solution. Because of the strong and dominant position of the city of Aalst in this project (a lot of capacity and contractual relations with the private partners), the partnership can be viewed as a lead organisation network (Provan and Kenis 2008).

The partners had different motives to be involved in the project. For the city of Aalst, there were multiple motives to be involved in the project. First, Aalst was trying to build a thorough "City of Care" where frontline social care was very important. This project would be a manifestation of this policy. Political motives and the vision of the administrative services of the city drove their ideas for the project. Additionally, Aalst wanted to implement the created solution in their own city and did not want to stop (as the grant agreement proposed) when a workable tool was created that could be scaled-up to other cities (without it being implemented in the municipality). They also had the intention to ask for an additional grant of the Flemish government to finance this further implementation. Give a Day on the other hand was primarily concerned with scaling-up the matching platform they had already created for

a similar project. They wanted to experiment with different kinds of IoT technologies to see how they could refine and improve their matching platform. Give a Day – being a small company working in a niche market – wanted to assert itself as the first company that had a general solution for matching citizens. The motives of MonkeyShot were primarily oriented towards delivering consultancy of high quality to the city of Aalst. The other local governments that were involved were – because of a lack of capacity – unable to invest a lot of time in the project. Their motives to be involved in the project are therefore rather vague. It seems as if both local governments recognized the advantages of the project but were impeded by their shortage of manpower. Shifting the lead and execution of the project to the project team of the city of Aalst was the most efficient solution for them. With regard to DVV Midwest, local elections had a more profound impact on the political environment of the partner (because it was a collaboration of municipalities and not a municipality itself, such as Aalst and Dendermonde). Shifts in political priorities might therefore also be a reason for the lack of involvement in the project.

Network management

There were differences in opinion between the core partners regarding the content of some of the ideas and the motives of the partners. This became apparent in the interaction between Aalst and Give a Day. As discussed above, the motives of both partners differed a lot. Aalst wanted to create a solution tailored to the needs of the city, instead of developing a solution that could be scaled-up to other municipalities. Give a Day, however, wanted to scale-up their solution so it would be used by other municipalities and not only by Aalst. Additionally, Aalst wanted to start from a blanc sheet. They wanted to invent something new, tailored to the needs of the users. Give a Day however already had a similar solution that could be the foundation for the 'Burenmatcher' and was not inclined to make a lot of changes to their existing tool, nor to start from a blanc sheet. Furthermore, Aalst had some issues with the usability of the existing tool of Give a Day.

Because both partners were involved in the idea generation process, both wanted to claim the intellectual property of the tool. For Aalst, this was important because they wanted to

implement the tool in their own city, without being dependent on a software supplier, and wanted to be recognized for their work on the solution. For Give a Day, this was important because the organisation wanted to diffuse the tool to other municipalities and associations. Furthermore, there were differences in organisational cultures between Aalst and Give a Day. Give a Day was a small, agile start-up that was able to quickly make decisions and adapt to unforeseen circumstances. Aalst, on the other hand, was a large organisation with different layers of accountability and decision-making. Moreover, Aalst was responsible for service delivery for every citizen (not only for those who could pay for it). They therefore had a totally different objective than Give a Day. These differences in perceptions, motives and cultures caused some tensions between the partners.

Both partners were quickly becoming aware of the difference between their viewpoints regarding the goal and features of the tool. These issues were brought up in different meetings of the project team. Through open discussion and bilateral conversations between the project coordinator of Aalst and the CEO of Give a Day, most of these issues were easily solved. When it became clear that the users did not want IoT technologies in the matchmaker but would prefer to make use of the phone, Give a Day sought additional external knowledge and expertise about phone technologies, by consulting the service desk of Twilio. However, neither of the two partners were aware of the differences in perceptions regarding the intellectual property (IP) of the tool. It was only in the last half of the project, that the discussions about the IP arose. Because of the legal complications of the decisions regarding IP, the legal office of Aalst became involved in the discussions. Eventually, they drafted a contract between the partners about how to handle the IP after the project was finished. Both partners signed this contract which concluded the conflict.

Dynamics and activities in the innovation process

Ideas were generated in different phases of the innovation process. Before the procurement phase, the partners in the steering committee had already generated some ideas about how to connect neighbours and how IoT could play a role in this. After the procurement phase, Give a Day and MonkeyShot became part of the partnership. This provided the partnership

with new insights into what was possible with several existing technologies (e.g. the matching platform of Give a Day). In the later stages, users became involved through interviews, focus groups and co-creation sessions. This ultimately led to the adoption of a whole new concept (Neighbourhood bell), and the abandonment of the original one (IOT). Interactions between the various partners therefore had a profound effect on the end result of the project.

There are both creative processes and processes of convergence (consensus building) visible in this innovation process. New ideas were generated as the partners learned more and more from each other and from the users to invent new solutions. The collaboration with the users is especially interesting in this regard. Without the involvement of the users, the partners would have built an application that worked with IoT technologies, which no user would allow in his home. The users made it very clear in several co-creation sessions that these technologies would impede their personal space. Some of the users proposed to use a phone to connect people and make contact with them. This idea was quite different from the IoT ideas on which the partnership previously focussed. It also seems that some of the partners especially defended their own ideas at the start of the project (matching platform of Give a Day), but this changed throughout the process. Give a Day changed its platform to conform to the ideas of Aalst and integrated the call flow into their system to conform to the wishes of the users.

There was a high commitment to realize the ideas of the core partners, but – as mentioned – their motives for the realization were different. Aalst wanted to implement the solution in their city, while Give a Day wanted to scale it up. Because they were both very committed to realize the ideas developed in the project, but had different perspectives about how to realize them, this caused some tensions between the partners. The commitment to implement the ideas of the other partners in the steering committee was rather low. Dendermonde did test the tool in their own municipality to check its usability. DVV MidWest was not involved in the implementation/ testing phases of the project. Their commitment to implement the idea was low.

Strategies to achieve societal support for the innovation

Because the project was initiated by a partnership of a local government, political support was especially important for the project. This political support was highly present for the city of Aalst at the start of the project and during the project. The partners presented the project to the city council and the coordinator had several bilateral contacts with the alderman. Other actors outside of the partnership but within the wider health sector were moderately important for the project. Especially contacts with AZ Delta (hospital) and several health care providers who were interviewed to identify the needs of patients and care providers, became important for the later development of the tool. There were also contacts with several organisations in the health sector to draft the project proposal to apply for the Vlaio grant. There was a high support from these actors, both at the start of the project and during the project, because the tool would enable neighbours to conduct some of the (simple) tasks of the care providers. The media were less important for this project. It was unknown by the media at the start of the project, but by distributing a press release and through communication with local media, it was picked-up by the media. This increased their support during the project.

User involvement

There were different kinds of users involved in different phases of the process. The most important involved users were elderly people, who were already affiliated with other participation projects of the city. There were for example some users who were involved because of their function as representative of a neighbourhood committee. Other users were identified through the 'coffee bus' initiative of the city of Aalst, with which short information rounds about the project were given in various areas of the city. Another group of involved users were the health care providers. This group of users were able to give information about the needs of certain elderly people and on how a matching tool might assist them in these needs. Aalst involved the users to obtain more insights into the experiences, needs and demands of these users. Aalst wanted a tool that was tailored to the needs of these users. This was only possible if these users could articulate their needs and demands for the tool.

From their side, the group of elderly people were involved because of their belief that such a tool might assist them in some tasks, or it might remedy their loneliness. Additionally, some users were also involved because they were interested in the subject, because they were already working on similar topics, or because they represented a group of people who might use such tools. The group of health care providers wanted to be involved because of the opportunity to assist in building a tool that might facilitate them in their daily professional activities.

There were several methodologies used to involve the users. Information was given through the 'coffee bus' and through several of the co-creation sessions. Users were asked specific questions (consultation) by using surveys and interviews. The users could give their opinions (advise) to several of the related topics through the focus groups and co-creation sessions that were organized by Aalst, Give a Day and MonkeyShot. In these co-creation sessions, the users also worked out ideas (e.g. the 'Neighbourhood bell') that were later adopted in the tool (coproduction).

In the last phase of the project, 43 users were involved in testing the matching tool. They gave feedback about the usability of the functionalities of the tool. Because of the profound involvement of the users and the large impact of the users on the end result of the project, the user involvement can be regarded as very successful in this project and it is an example for similar projects. Some success factors can be identified: 1) pre-existing involvement of some of the users (user network); 2) a lot of capacity to conduct the user involvement phases (private partners + project coordinator of Aalst); 3) a lot of diverse methodologies to capture the needs of the users; 4) smooth contacts between the users and the partners.

Role of ICT in the collaboration process

ICT was used in the collaboration process to make communication easier between the participants (conference calls, Skype, …). During the idea generation phase, MonkeyShot also used a technology to visualize the call flow for the 'Neighbourhood bell'. This helped the partners to see how the calls would be directed and was useful to develop the technologies

behind the call flow (i.e. the matching platform). User involvement was also facilitated through the use of technologies. Give a Day used a test version of the matching platform to let the involved users experience the functionalities of the tool. All of these technologies were used ad hoc, but some of them were very essential to the innovation process. Especially the test version of the tool created by Give a Day was essential to let the involved users experience the tool.

Success factors

Two variables are especially important to understand this case, namely network management and user involvement. The impact of these two variables on the result of the project was quite extensive. If the conflict between Aalst and Give a Day regarding the intellectual property had not been solved, the collaboration would have ended prematurely. This conflict was the result of different perspectives regarding the development of the tool and the ownership of the tool, which both were issues that were reflected by the positions and motives of the individual partners. Aalst wanted to invent a new tool that it could use as part of its service delivery to its own citizens. Give a Day wanted to refine their existing tool, which it then could scale-up to other municipalities. Network management (e.g. communication, discussion, contact) solved these tensions, but the sources of these conflicts reveal a broad set of variables that might also play a role in similar collaboration projects. These variables are: hierarchical position (Aalst as procurer vs. Give a Day as contractor), accountability (citizens of Aalst vs. market), organisational objectives (general service delivery vs. niche service delivery), strategic opportunities/motives (realizing innovation in own city vs. scaling-up/ commercializing innovation), and organisational cultures (bureaucracy vs. start-up).

The impact of user involvement on the end result of the project is not easy to overstate. The users completely redirected the focus of the project from an IoT enhanced innovation to an innovation with phone technologies. This even led to discussions between Vlaio and Aalst, because IoT technologies were part of the grant agreement Aalst had with Vlaio. Because even Vlaio could not ignore the wishes of the users, the partners were eventually allowed to proceed in the project. The frequency and depth of user involvement pushed the project into

a different direction, but also allowed the partners to make a strong case for their innovation. If users had not be involved this thorough throughout multiple phases in the project, chances are that Vlaio would have not been convinced about the change of direction and the partners would have been obliged to make an IoT innovation (which probably would never have been used by the target group). Furthermore, by suggesting the phone as communication channel for non-digital users, the users opened up a new avenue for innovation, which was blocked by the sole focus on IoT technologies. Give a Day and MonkeyShot were triggered by this change in focus to start looking for ways to connect the platform with phone technology and eventually came up with the "Neighbourhood bell". In other words, it seems as if the user involvement in this project triggered creative processes of learning, idea generation and exploration, which would not have been there without the involvement of the users.

What makes this case also an example of good user involvement is the way in which the partners dealt with the contributions of the users. It would have been far easier for the partners to ignore the wishes of the users to develop an innovation with phone technology rather than with IOT. Their chances of obtaining additional grant money to implement the IoT innovation in Aalst would also have increased. Instead, the partners listened to what the users had to say and developed something that was not completely in line with the grant agreement. This is testimony of the willingness of the partners to develop something for the users, and not to strengthen their own position.

3.2.3. Nursing home Booghuys (Belgium)

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Introduction of the project

The nursing home Booghuys, part of the city of Leuven, provides care for elderly people. In 2016, it was decided that the nursing home needed some renovations. The involved actors worked out some concepts for the renovations and did several working visits to other nursing

homes. However, in June of 2017, the involved actors decided that the renovations would not fulfil the wishes of residents and staff, and they eventually worked out a concept for a new building. This allowed the involved actors to start from a blank sheet, and to construct a building which was tailored to the wishes of residents and staff. Because of the specific needs of some of the residents (people with dementia), technology played a crucial role in the design of the building. Soft- and hardware components were integrated in the building to provide maximal support for both residents and employees. Examples of these technologies are smart cameras which detect when residents fall out of their beds, tracking technologies coupled to access cards that provide residents with ample movement freedom without the necessity of physical intervention, and integrated software that connects the various technologies in one system.

The project started in February of 2016 with the idea to renovate the current building in which the nursing home Booghuys was located. Several concepts were formulated but each of them was faced with the physical limits of the current building. For example, the current rooms were unfit for the new reality that many of the residents were single, which reduced the space that could be used for individual rooms. Moreover, the costs for the renovation of the building in some cases exceeded the price for a new building, which encouraged the involved actors to construct a whole new building. At that time (May 2017), a private consultant (The Wizard of Dreams) became involved in the project. The Wizard of Dreams (TWD) advised the nursing home regarding the integration of several eHealth technologies in the new building and worked together with the nursing home on the procurement procedure for the construction of the new building. In October of 2017, the tender conditions were specified and in March of 2018, the contract with the contractor was closed. This contractor involved several other subcontractors and in June of 2018 the works were initiated. TWD remained highly involved in the project as a system integrator. TWD was responsible for integrating the technologies the subcontractors proposed and aligning them with the physical conditions of the building. In February of 2019, the proof of concept (POC) was initiated, which was a test environment in a few rooms of an existing nursing home which incorporated all of the used technologies to

let the residents and staff experiment with these technologies. The POC was of crucial importance for the choices of technologies and furniture in the new nursing home. In June of 2020, the project was finalized.

The eHealth innovation

The innovative functionalities of the eHealth technology are focused at enhancing the support for employees of the nursing home in taking care of the residents. The technologies facilitate the work of the employees by providing automatic entrance to specific rooms, making the environment of the residents safer, and gathering data about the individual residents to help take care of them. At the level of the technological components, we can delineate the hardware and software components. The Bluetooth trackers are the first example of some of the hardware components used in the project. They work with both tracking devices in the form of wearables and Bluetooth receivers which are attached to the electric doors or gates. These doors or gates only open when residents with the proper Bluetooth signal come close. This prevents residents which are not allowed to go outside from getting lost (this triggers an alarm which calls for intervention of employees). This increased management of the movements of the residents is possible up to the level of individual rooms (e.g. a confused resident who tries to enter the room of his neighbour instead of his own, will not be provided access to this room). Second, smart cameras are used to detect if a resident has fallen out of his/her bed. If the resident stays too long in a demarcated area around his/her bed, the camera recognizes this as someone who has fallen out of bed and cannot stand up without assistance, which subsequently triggers an alarm that alerts the nursing staff. Because these cameras are present in every room and present some difficulties regarding the privacy of the residents, the partners have implemented a “privacy switch” which turns off the cameras/blurs the images when the resident wants to have some privacy. The cameras also allow for virtual patrols of the nursing staff. Instead of doing their last round to check if every resident is fine, the cameras can also be used to do this virtually, which safes a lot of time and does not interrupt the sleep of the residents. Either way, the technologies provide both residents and employees with a lot more choice and support in their daily activities.

The most important software component the project achieved is the creation of a system which integrates the data from all of the hardware components. This is not only limited to the Bluetooth trackers and smart cameras, but includes the security cameras in the building, the dispatch system, the fire control system, etc. The system can be accessed via an app which is installed on the smartphone of each employee, which enhances the efficiency, effectiveness and amount of interaction between residents and caregivers. Because the system integrates all of this information, data can be used to recognize underlying patterns of behaviour, which might allow the nursing staff to prevent accidents before they occur. The data can also be used to increase the general health and well-being of the residents, because they are monitored all the time. Personalized interventions and caregiving, and the prediction of accidents all become possible due to the large amount of collected data.

To measure the innovativeness of these innovations, we look at both the innovativeness of the functionalities provided by the technologies and the innovativeness of the technologies themselves. We do this using the criteria of newness and impact. If we consider the previous situation (in which residents and caregivers were not supported by the technologies) with the new situation, we see a remarkable increase in possibilities for all of the users. The employees were for example not able to influence the movements of the residents without a physical intervention, and the residents would not have been able to confidentially walk around the building without constantly being impeded in their movements by the nursing staff. Furthermore, the impact of the innovation is considerable. All residents and employees of the new nursing home use the innovation and the related technologies, which testifies to the impact the innovation has on its environment. Also, the potential rate of diffusion of this innovation (or some of the technologies) to other nursing homes in Belgium is arguably fairly high because of the universality of the problems these technologies solve, and the relative ease in which some of the technologies can be incorporated in existing or new buildings. We have to underline as well that this is the first time in Belgium that a similar innovation has been achieved, which makes the functionalities highly innovative. However, since the innovation is only implemented in one (of the four) nursing homes of Zorg Leuven, the relative

use of the innovation is rather low. Only those people who will be relocated from the old nursing home to the new one will benefit from the innovation.

If we look at the used technologies in the innovation, none of the technologies are very new, but the way in which they are implemented does present some innovative features. Bluetooth technology is already established for some decades. Smart cameras, too, are used a lot in surveillance systems. The adoption of these technologies and the way in which they interact to ensure an optimal caregiving for people with very specific needs, shows how existing technologies can be recombined to create highly innovative functionalities. Furthermore, the integration of diverse hardware and software components in one app has not been achieved in similar cases, which points to the newness of some of the combined technologies. This integration system had to be built from the bottom-up because no pre-existing software was available. The impact that these technologies have on the actual innovation are therefore very profound.

Partnership structure, governance and resources

Because of the limited size of the partnership, most actors in the partnership were core actors. The most important of these core actors (meaning that they were involved throughout the whole project) were the nursing home Booghuys (and Zorg Leuven, which is the legal entity of the nursing home), TWD and AR-TE/Stabo (which was the design office which worked out the design of the building). After the procurement phase, the contractor Vanderstraeten also became one of the core actors in the partnership, together with its subcontractors Engie and Bloo-Loc which were, among other things, responsible for the technologies used in the building.

From a project perspective, the more peripheral actors who played a role in the project were the employees and the residents (and their families). These actors were closely involved in the test phases of the project (POC). Both the financial and legal resources were brought into the partnership by the nursing home Booghuys/Zorg Leuven. Since the nursing home Booghuys/Zorg Leuven was the procurer, they were also the coordinating actor in the partnership. TWD provided the partnership with extensive knowledge and expertise regarding

system integration and eHealth technologies in general and was also responsible for the technologies (e.g. writing software to connect the various hard- and software components of the other contractors). Because of its extensive contributions to the partnership and its high responsibility for the success of the project, TWD had to work together with all of the partners to achieve the end goal. AR-TE/Stabo especially provided knowledge and experience from similar projects to the partnership. They were crucial for the design of the building, but also for various, more subtle features of the building. An example of this is the integration of lighting technology based on the 2017 Nobel Prize for Medicine (circadian rhythm) in the resident rooms of the building. Vanderstraeten, Engie and Bloo-Loc were responsible for constructing the building and implementing the various technologies in the building. They especially brought expertise, employee capacity and competences, construction material and ICT (cameras, Bluetooth trackers, etc.) into the project.

Most of the involvement of these actors was fairly economic in nature, meaning that they participated in the partnership because they were being payed. However, some of the partners were also motivated by the innovative potential of the project and the potential resulting future opportunities. Both TWD and Bloo-Loc are small enterprises working in a niche which need best practices such as this project to illuminate their significance for the sector. Large, innovative projects such as the nursing home Booghuys are essential in order to gain more attention and publicity. The employees and residents wanted to be involved in this project because they would later use the technologies. Because these technologies would be used by these actors, the partnership incorporated them into some of the phases of the project. One of the respondents formulates this clearly as follows “We are doing this for them [employees], to make their work easier, not for ourselves”.

All of the core actors were part of the project team. The project team was chaired by the coordinators of the nursing home/Zorg Leuven. There was a clear hierarchy between the involved actors. The nursing home Booghuys/Zorg Leuven were as the procurer the dominant actor in the project, while all the other actors were contractors. This hierarchy is also visible at a lower level. The tender specifications demanded accountability mechanisms between the

contractor and subcontractors, meaning that Vanderstraeten was accountable for the actions of Engie and Engie was responsible for the actions of Bloo-Loc. This prevented that contractors would point to other contractors if something went wrong. Because of the accountability mechanisms between the nursing home/Zorg Leuven and the other actors (and even between some of the contractors), the nursing home/Zorg Leuven has many features in common with a lead organisation (Provan and Kenis 2008). The lead organisation acts as the broker between the other partners and has also a lot more power than the other involved partners to make decisions. The contractual relationship between the lead organisation and the contractors further strengthens this power imbalance, because there is also a legal foundation for the position of the lead organisation.

Regardless of the accountability mechanisms between the partners, a lot of experimentation – of which the POC is the best example – has occurred in the project. The test environment was designed to replicate a real working environment as much as possible. It allowed both residents and employees to experiment with the new technologies, as feedback was gathered through paper notebooks and in various project meetings. As such, the partners had to adopt a flexible stance towards the project. An example is provided by the wearable tracking systems residents would need to wear to enter specific areas of the building. One of the subcontractors provided examples of these wearables, which irritated the skin of some of the residents. The contractor then had to search for an alternative, which was not anticipated. Because of the early set-up of the POC, much creative discovery was possible without the risk of jeopardizing the deadline for the completion of the project. We can therefore say that this project is an example of an explorative innovation process in which exploring new ideas, a highly flexible innovation process, trial-and-error/experimentation, and creative discovery were key characteristics.

Network management

There were a couple of instances in which conflicting perspectives arose. For example, whereas TWD wanted very specific materials or modifications of materials, Engie would rather use a standard design which had already proven themselves (i.e. smaller risk). Additionally,

the tender documents mentioned "standard solutions", so modifications to these solutions by Engie would be in conflict with what the tender stipulated. In the end, Zorg Leuven argued that they would deliver some of these modified solutions, which removed the responsibility of Engie. Many of these issues were solved bilaterally between the partners or in the project team, under supervision of the nursing home/Zorg Leuven. There were, however, also conflicts between the procurer and some of the contractors. For example, the nursing home/Zorg Leuven wanted user-friendly Bluetooth trackers and was not satisfied with the solutions Bloo-Loc suggested, while Bloo-Loc felt that they were not responsible for delivering special or appealing designs.

Most of the differences in opinions could be defused by open discussion and dialogue between the partners. In case of severe conflict, the procurer used contractual enforcement to make sure the contractors conformed with its demands. The accountability mechanisms between the contractors benefited this enforcement, because accountability measures could be taken if one of the partners did not deliver what was demanded. Furthermore, TWD functioned as a broker between the diverse partners, which enhanced the interaction between the partners. There was an accountability relationship between Zorg Leuven and TWD, but not between TWD and the other private contractors, which made the position of Zorg Leuven stronger in this partnership.

There were also instances in which additional knowledge was needed, for example on the implications of dementia for residential environments. The nursing home Booghuys and Zorg Leuven organized some working visits to other nursing homes to acquire this knowledge. Moreover, people from “Expertise centre for dementia Flanders” were consulted, as were people which had experiences with small-scale normalized living (the core concept of the new nursing home). In short, we see a lot of examples of exploring and connecting network management strategies in this partnership (Klijn et al. 2010). However, some conflicts required stronger incentives, which was provided by the power imbalances between the procurer and contractors, exemplified by the contractual and accountability relationships between the partners (i.e. process agreements, cf. Klijn et al. 2010).

Dynamics and activities in de innovation process

Idea generation was present in the project throughout the whole innovation process. Most of the ideas were created in the phases before the procurement process (in which the design office was involved) and during the POC. Yet, due to the intensive interaction between the project partners, a lot of other instances can be identified in which new ideas were generated. For example, after the procurement stage, the initial ideas regarding the building and technologies were created in a meeting with all the involved partners. Furthermore, ideas regarding the innovation were created before the actual procurement with a collaboration between Zorg Leuven and The Wizard of Dreams. New ideas regarding the way in which residents could have maximum freedom to move around were created when Bloo-loc became part of the consortium.

In most of the innovative idea generation, ideas were created through collaborative endeavours (by sitting together and think about possibilities). In some other cases, partners tried to defend their own ideas which caused conflicts between the partners. Most of these conflicts could be defused through dialogue between the partners. On some occasions, however, the nursing home Booghuys/Zorg Leuven had to use the contractual conditions to enforce certain demands. Because of this contractual relationship, partners were generally careful that some actions would not create outcomes which were not in line with the contract conditions. This caused the partners to be very vigilant towards ideas or actions which diverged from their own or from what was written in the contract. All of the partners were however committed to implement the selected ideas. For some of the partners who worked in a niche, this project presented also important opportunities to enlarge their market position, which stimulated them to make the implementation a success.

Strategies to achieve societal support for the innovation

We identified three types of external actors who might have an impact on the support for the innovation process, namely the relevant elected politicians, actors outside of the partnership in the broader health sector and the media. The elected politicians present in the board of directors of Zorg Leuven were extremely important for finding societal support, because Zorg

Leuven was established by the city of Leuven as a decentralised public organisation. They made the decisions regarding the budget and general concept for the new nursing home and they were therefore extremely important for the success of the project. The politicians were also very supportive of the new nursing home, both at the start of the project and throughout the project. The core partners (especially the coordinators) tried to stimulate this support by giving presentations before the board of directors of Zorg Leuven and communicating bilaterally with the chairman of Zorg Leuven.

Because the project was not dependent on other organisations in the broader health sector, it was not necessary to involve a lot of other health actors besides those that were already involved. The work visits to other nursing homes that had implemented similar innovations were especially directed at generating new ideas and knowledge, and less at seeking support for the project. However, through these work visits, the project partners increased the legitimacy of their ideas and they were able to use 'best practices' of the other nursing homes.

The media was the least important external actor to achieve societal support in this project. No specific actions were performed towards the media to increase this support.

User involvement

As we have mentioned, two types of users were involved in the project. First and foremost, employees which would later work in the nursing home participated in both the conceptual stages of the project (before the procurement stage) and in the testing phases of the project (POC). Some of the employees were present at the work visits to other nursing homes. The employees who became involved in the project were selected by the coordinators because of their interest in such projects and their availability. After all, all of the involved employees had strict schedules for their work in the nursing home, which would not always allow for extra activities besides their actual work. This made their involvement challenging to organize and created difficulties in motivating employees to become involved. A strong motivation for the employees was the fact that the innovations would affect their work environment drastically. Their involvement gave an opportunity for a preview of how things would work in their new

work environment. They could experiment with some of the new technologies and were able to direct certain implementation towards their wishes. This made the project for some employees very appealing.

The involved employees were not only informed by the coordinator about the goals and desired outcomes of the project in several stages of the process but were also thoroughly consulted through workshops and discussion meetings. For instance, there were interactive exercises with the employees/residents about how they perceived "homeliness". Involved employees were especially important in the POC. They tested several of the technologies used in the resident rooms and could advise the core partners about the user friendliness of these technologies. Notebooks were used to write down their experiences with the technologies and how it could be made more user-friendly. Because of the constant feedback between involved employees and core partners in the POC, we can say that the employees co-produced some of the technologies together with the core partners. This co-production was also visible in the earlier stages of the project in which the core partners developed the vision statement of the nursing home in collaboration with the involved employees.

The second group of involved users – the residents – were also involved throughout the project but were especially important in the testing phases of the project. The involvement was crucial for the core partners because this allowed them to see how residents experienced these technologies and which problems they faced. The residents in turn would be better prepared for their relocation to the new building, which can explain their motivation to be involved. After all, all of the residents which would be relocated to the new nursing home would be highly affected by the innovation. The more the residents could prepare themselves for this relocation, the less uncomfortable the relocation would be. Some residents gave their consent (or their family gave their consent) to become involved in the POC, which meant that these residents would live in rooms which included the technological features of the future nursing home.

The core partners intentionally selected some residents which were in early stages of Alzheimer's disease, which made it possible to receive thorough feedback of these residents. They also selected some residents which were in the late stages of Alzheimer's disease, which allowed an observation of the group of residents which were most vulnerable and potentially dependent on the technologies. Some of the residents and/or their families were also involved in what was called the "design group". In this design group residents/family were asked specific questions regarding the design of the nursing home (e.g. how they saw their relocation, their rooms, the furniture, the building itself, what they understood as homeliness, etc.).

The involvement of the residents and employees in the project was successful because of the way in which user experiences were translated in the implementation. The previously mentioned example of the Bluetooth wearables which irritated the skin of some of the involved residents is a clear testimony of this. The involvement of the users amended many of the technologies implemented in the new nursing home and contributed to a user-friendly environment. The partnership prevented a lot of problems which might occur after implementation by testing most of the technologies on the residents and employees.

Role of ICT in the collaboration process

As we have mentioned, technology was of crucial importance for both the observation of user experience and the generation of new ideas/solutions/insights. Without the technologies in the POC, it would not have been possible to have such a clear perception of which implementations worked and which needed to be amended. However, all of these technologies would also become part of the final innovation and no other technologies (such as online user interfaces to test the innovation) were used to stimulate the innovation or collaboration process.

Success factors

The case of the care technology of the nursing home Booghuys is an example of an innovative service which was created out of a partnership with diverse actors. The project can be seen as highly flexible and explorative in nature. The core partners created an environment in which

actors could experiment with a test diverse options in an isolated setting. The whole project is laced with instances in which decisions or implementations needed changes, which made them better and more aligned towards the needs of the users. Because of the explorative approach, the project was more complex than similar projects, and this complexity had to be managed. The coordinating actors primarily used two strategies to manage this complexity. First of all, contractual and accountability measures were used to enforce some demands and decisions upon the partners. The contract and accountability mechanisms between the partners formalized the relationships between these partners, which made the relations perfectly clear for every actor (e.g. accountability of actors towards other actors). Second, open discussion and dialogue made it possible to manage these relationships in the face of complex and unforeseeable circumstances. Working with project teams facilitated these interpersonal interactions. Another crucial factor in this project was the openness towards employees and residents and the "testability" of the innovations. Setting up a test environment and a thorough participation process with the users generated not only bases of support amongst this group of stakeholders, but also provided new and useful ideas and experiences. Additionally, the large amount of freedom the coordinators had to learn which practices would work best, had a lot to do with the general support they received from their political leaders. There was not much intervention from political representatives and the partners could conduct their objectives without a lot of political interference.

3.2.4. CoNurse (Estonia)

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Introduction of the project

The objective of the project was to reduce human-resulted errors in carrying out standard nursing procedures. Cognuse detected a need for it in Estonian health care through interactions with the North Estonia Medical Centre (henceforth NEMC), as there was a lack of necessary tools for supporting health care professionals. Cognuse is a private company building ICT solutions for healthcare professionals and patients. They focus on improving the

guidelines adherence to improve care quality and to reduce complications from avoidable human errors. They have carried out various projects with regards to health and welfare, like a platform connecting service providers and elderly in need care, a website for interactive practices for speech impairments and other innovative solutions.

The various problems with nursing procedures guidelines have been well-known within the health care sector for decades. NEMC itself experienced a clinical error in the blood transfusion procedure, which resulted in a fatality. This made the health care provider turn attention towards supporting instruments for health care specialists. This allowed the initial project to expand into an additional standalone development that specifically addressed blood transfusions. Cognuse and NEMC jointly highlighted the possibility of the CoNurse solution within the Estonian health care system. This resulted in their joint collaboration to introduce an app with a voice command function for supporting health care professionals in conducting the blood transfusion procedures. It offered the health care providers a legitimate tool that could be used as evidence in legal proceedings. Health care providers were enabled an additional evaluation tool for measuring the resource costs of procedures, which the app enabled. In addition, the tool could play a role as an educational and assistance tool during transitions in nursing procedures. The project resulted in a voice guided and commanded app that included several digitalised nursing procedure guidelines, which were piloted in the four largest medical centres in Estonia.

The project was initiated in February 2017 with brainstorming sessions amongst NEMC and Cognuse occurring to arrive jointly at a problem formulation and solution. The engagement of the two actors was enabled by an external collaboration partner. The development process was started in April 2017, which was carried out solely by Cognuse, with the first tests occurring in May 2017. During this period, Cognuse also tested the opportunity to implement Estonian voice commands into the app. Other changes to the app were mostly related to the content of nursing procedures guidelines. At this stage, the main actors involved remained Cognuse and NEMC. During this period, Cognuse also engaged in first attempts to introduce the solution to other health care providers. After this, Cognuse engaged in initial prototyping,

which resulted in the implementation of the solution in June 2017. The solution has since been functional and in the process of being disseminated towards a wider spectre of actors. The project officially ended in the beginning of 2018 with a follow-up project that lasted until the Summer of 2018.

The project was of an exploitative nature, as it built upon existing solutions with additions to an established template for implementation. Cognuse consciously opted for best international practices and decided to combine them to provide a competitive solution within the health care market. It is difficult to implement anything more novel in clinical conditions, as solutions have to exhibit a high level of reliability, usability and robustness to receive positive evaluations from piloting professionals. Additionally, it has to remain cost-effective in order to attract the commitment from health care providers. These factors limit the level of experimentation that the solution can incorporate.

The eHealth innovation

The innovation comprises of an app, initially made for IOS, but later for Android as well, that provides voice commands to guide nurses through nursing procedures. Nurses can engage any digitally prescribed nursing protocol and carry it through based on a selected number of voice commands. The solution enables the nurses to additionally read through the guidelines on the app, if their preferred way of processing information is through visual communication rather than through audio. It provides nurses a key overview of the protocols to carry out. The solution has currently English voice support, but also has had Estonian language support. Nurses receive the voice commands through Bluetooth headphones, which enables them to carry out protocols without the need of a phone.

The functionalities provided by the CoNurse solution are important, as previous guidelines have been very uncomfortable to use and only accessible through folders on the computer, rendering them impossible for usage during work routines. The modified and simplified guidelines enable a safety net for health care professionals during the carrying out of procedures. Cognuse has opted for off the shelf solutions and the use of an app to take into

consideration the willingness of health care providers to invest into the solution. As a result, technological innovation has remained mostly limited.

The innovation has been implemented through various pilots throughout the world, but its usage in Estonia has remained limited, and Cognuse remains currently looking for opportunities for expansion. They have tried to reintroduce the solution to health care providers in Estonia, who have retained an overall critical stance due to the feedback from past pilots. Therefore, within the Estonian context, the solution has resulted in limited success. The users have retained a stance that, although the solution provides support, there are user-friendliness issues, which makes it difficult to incorporate it into daily usage. This is additionally affected by the fact that nursing procedures differentiate between health care providers that makes it more difficult for private enterprises to profit, as they need to make adjustments for guidelines to accommodate the difference within different health care providers.

Cognuse is looking for opportunities for expansion, as currently the voice commands have been limited to English because of limited voice recognition in other languages. As a result, Cognuse is looking for opportunities to expand on it. Additionally, opportunities to link the solution with the hospital information system to exchange necessary data have been searched for. These efforts are linked with Cognuse's intention to increase the value proposition for health care providers in an effort to make the app more appealing.

The innovation has had mixed success and within the Estonian context resulted in failure. The concept is valid and does attempt to address the problem. However, in its current state it has usability issues that affect the possibility to use it in real-life conditions. This was reflected in the feedback by health care professionals, who perceive it more as a burden than a supportive tool. In addition, the mixed success of the pilots has resulted in limited willingness amongst Estonian health care providers to take up the solution as well. Its innovativeness is limited, as there are alternative tools on the market, which lack the exact functionalities but provide a similar outcome, and the technologies are very commonplace. This was highlighted by

disappointment from health care providers, who expected more from the project, as they perceived the solution to be outdated.

The innovation's successfulness is related to its cost-savings for health care professionals and the solution limits possible clinical errors. It is different from alternative solutions because of an option for voice guided guidelines and data from conducted guidelines which provides an overview to health care providers. The innovation provides a safety net to health care providers and incorporates digitalization into carrying out daily procedures. However, user-friendliness and usability remain crucial factors that limit successfulness and contest the cost-savings and safety net aspect.

In its current form the innovation does not solve the problems for which it was generated. It remains an inconvenience rather than a supporting tool for nurses. Professionals find themselves having to control the solution rather than letting it provide supportive assistance. As health care professionals are already overburdened, then the tool's benefits are inhibited by its usability issues. Additionally, the way people obtain information differs, so a focus on voice commanded tool may not have similar usefulness for all health care professionals. Moreover, the feedback revealed that patients reacted disapprovingly when the nurses started communicating with the app rather than with them.

Partnership structure, governance and resources

For widespread engagement and involvement of the various actors in the health care sector, Cognuse as the coordinating actor made it a matter of principle to engage the key actors within the health care sector. As a result, they attempted to engage – with mixed results – governmental actors (Ministry of Social Affairs; Health Board; Health Insurance Fund), health care providers (NEMC + other actors), educators in the health sector (Tallinn and Tartu Health Care College) and Connected Health Cluster, which connected health related companies with each other. Each actor possessed a crucial role in the health care system. Cognuse was unsuccessful in engaging the governmental actors to the extent that they desired. Additionally, the extent of engagement of the health care providers and educators was

successful but occurred within a limited timeframe. Cognuse was able to engage the four largest health care providers to an extent which is rare for private initiatives. For health care providers, the incentives were connected to the possibility to reduce costs and increase adherence to guidelines, limiting possible errors. Governmental actors' incentives were related to the extent that the initiative attempted to address a long-time problematic field. However, they lacked more direct incentives, as it remained an initiative which was primarily led by the private sector, and which could not receive more support due to the legislative framework, which inhibited further involvement.

The governmental actors design and fund the health care system and their role was crucial in directing the overall strategy, which provides options for new innovations in the Estonian health care system. Health care providers are the implementers of the tool and provide insight into the possibilities of the tool. Educators provided education for the next generation of health care professionals and their engagement enabled to incorporate the use of supporting ICT tools in education. Their role was also crucial in designing the nursing procedures to be used amongst various health care providers, as the state has put more effort into reforming the field to address the disparities between health care providers. The Connected Health Cluster was crucial for providing contacts amongst relevant actors, support for the innovation process, co-funding and especially legitimacy, which can be difficult for starting enterprises within the field.

The core partners within the partnership were Cognuse, Connected Health Cluster and North Estonian Medical Centre, who signed a joint development agreement for the CoNurse project. The initiative was spearheaded by a private sector actor, who opted for a simplistic governance structure due to limited available resources. The project team consisted of members from Cognuse and NEMC with individuals from other organisations being engaged based on the partnership's needs. Cognuse was responsible for the technical development and NEMC and later other health care providers were responsible for the provision of content and the determination of the medical procedures for usage. Other actors retained a more peripheral role, as they joined at a later date and remained involved at a lesser level. The

Ministry of Social Affairs resigned from the project due to conflicts with Cognuse, after being engaged in the initial stages of the project.

Throughout the project, Cognuse retained the coordinating actor role, which they held through monopoly over information exchange, reporting, initiating new and maintaining existing rounds of interactions. The partnership was governed by a lead organisation (i.e. central, leading organization which drives the partnership), as Cognuse held monopoly over technical aspects, remained responsible for initiating new interactions with new actors and guided the overall direction of the solution.

Network management

The problem with nursing guidelines was widely acknowledged amongst different actors. The positive effect from adherence to guidelines has been supported by previous studies and is perceived strongly amongst health care providers and governmental actors as well. Throughout the project, certain complexities occurred, which had a strong impact on the project:

- Strategic behaviour from partners
- Differences regarding the best possible solution

The expansion of the solution was very difficult in the Estonian context for Cognuse and remains so due to differences with the Ministry of Social Affairs. Strategic behaviour has become prevalent from both actors and has impeded the collaborative arrangement from expanding, as interpretation of actors' intentions has shaped their actions. As a result, the ability of the CoNurse project to expand in the Estonian context remains limited. This has been the result of two main elements: perception of intentions and interpretation of specific actions. First of all, Cognuse perceived the impasse to be related to the misinterpretation of intentions with the digitalization of the nursing procedures guidelines and the purpose of the application. Cognuse has retained that the functionalities of the app have been designed for a supporting and mediating purpose only. The ministerial representative perceived the situation to be connected to the principle of fair competition. The issues of availability of the results, especially the digitalized nursing procedure guidelines, became prevalent, as they

perceived financial motifs that would affect transparency. Secondly, Cognuse has made use of the feedback from health care providers to market the solution to additional actors for further expansion. This led to a further deterioration of the relations between Cognuse and Ministry of Social Affairs. The Ministry of Social Affairs has emphasised that their only possible position comes from arranging a supportive framework through strategic goal-setting within which Cognuse could operate. Cognuse perceives that this has affected the stance of other health care providers, as they rely on the Ministry of Social Affairs for the evaluation of the project and its accordance with the policy in health care due to their strategic position. The situation has limited the willingness of Cognuse to operate in the Estonian market due to the challenging success factors. Both actors perceive it as an insurmountable conflict, as they believe the other to be unable to comprehend the situation and the necessary actions, thus lacking the willingness to invest additional efforts into deliberations.

Cognuse opted for a very simple solution to address the problem of guidelines adherence, namely a voice commanded app. However, some of the involved health care providers concluded that the solution itself was a bit outdated and it would be more beneficial to provide a more interactive tool that worked on another basis than mere voice command, which proved too unresponsive during every day work processes. The main reason for this was the fact that the individuals' preferred mode of receiving information varies and a voice guided app does not offer the necessary flexibility. The health care providers highlighted the importance of receiving information through visual means or by audio, being in the preferred language. This was however conflictual with the expectation of other health care providers, who preferred the solution to focus on robustness to avoid any possible errors in operation.

As the project was impeded by certain key complexities, actors took efforts to provide clarity and solve them to help the project proceed. The actors used exploring and connecting strategies in an effort to specify the focus and engage all the necessary actors to ensure widespread implementation within the health care sector. Key factors were:

- Increasing interactions between conflicting actors
- Determining vision of the project from the start and framing the vision according to actors' interests

- Piloting the solution with other health care providers to specify the focus

Cognuse made strong efforts to tackle the scepticism and conflicts between actors, as well as within the actors' organisations. Representatives of Cognuse actively engaged in a mediating role to arrange meetings with the other actors to reduce organisational resistance towards change. They utilised the existing willingness from representatives of other organisations to plan meetings, trying to establish mutual understanding. However, these efforts yielded mixed results, as Cognuse failed to find mutual understanding with the Ministry of Social Affairs. This has had a strong impact on the CoNurse project, as it affected the choice of actors moving forward. The Ministry of Social Affairs resigned from the project and Cognuse has been highly reluctant to engage any actor they believe to be influenced by the Ministry of Social Affairs. There remains a strong level of scepticism from both actors that has impeded further interactions, which has caused the project to stall both in progress and in future developments.

Additionally, Cognuse has put strong efforts into framing the solution towards different types of actors. Due to the varying backgrounds and interests of actors within the health care sector, it remains necessary to highlight the different benefits of the solution, as actors have exceedingly different interests and priorities. Rather than to merely portray cost savings, the coordinators have opted to additionally highlight increased motivation of health care professionals, improved treatment quality and solving a longstanding problem within the health care sector, which has affected the stance of different actors towards the solution. However, to accommodate the interpretation, Cognuse had to remain very flexible to different actors' needs and constantly communicate the vision to foster further support amongst the partners.

In an effort to specify the focus, Cognuse made efforts to engage additional health care providers during the piloting phase. As health care providers have varying nursing procedure guidelines, Cognuse opted to engage more actors to determine the best possible user environments for the application and functionalities to be implemented. However, this resulted in additional issues, as the lack of interactions between health care providers resulted

in them approaching the project with standalone requests. This made it very difficult for Cognuse to accommodate to the suggestions of each actor. The isolated nature of health care providers was a resultant of Cognuse attempting to limit information overload towards each actor and thus communicating with them independently. This additionally led to setbacks, which affected the functionality of the solution.

Dynamics and activities in the innovation process

The core ideas were already strongly established during the start of the project. The engagement process started with brainstorming sessions that initiated the project. Most of the core ideas were set during these brainstorming sessions, where Cognuse and NEMC interacted with each other to determine the existing problems in healthcare and the best possible technical solution applicable to this problem. Cognuse based the app on the combination of the best existing technical solutions on the market and complementing them with additional functionalities. More widespread engagement occurred during the piloting phase and the changes during it were related to nursing procedure guidelines with a limited amount of technical changes. Interactions with partners did provide certain key advancements for the app, as feedback from health care providers during testing led to the implementation of the Estonian supported voice commands and the visual representation of the guidelines on the app. The testing in real-life conditions provided detailed examples on how interactions with the device took place and how the health care professional could incorporate it into usage. However, Cognuse did not always notify beforehand about the updates, which resulted at times in unexpected changes for health care providers.

The end-solution had to be a compromise between technical complexity and practical usability. This necessitated the search of a compromise between Cognuse and the health care providers. Although the collaborative arrangement was initiated based on the collaboration between Cognuse and NEMC, it quickly expanded to include other actors as well, which resulted in active communication between Cognuse and the health care providers to ascertain the best possible solution. This was enabled in the form of feedback obtained through emails, interviews, meetings and surveys. To maximise the feedback from health care professionals,

they were provided the opportunity to test the application first-hand in practice. This did create setbacks, as the project lost its initial focus because of the requests of different actors and the lack of standardization, as work routines differed. This was exhibited through the disagreement amongst partners, whether to increase usability through operability or adjust to the local context through language support change. The incongruence and disparity in ideas was further enabled, as Cognuse remained the only actor to communicate with all the different health care providers, which inhibited the opportunity to agree upon the final solution. The lack of communication between health care providers resulted in them possessing a different vision, which created more difficulties for technical development. The position as a broker did provide Cognuse an advantage in information asymmetry, but it resulted in fragmentation of user perspectives, as each health care provider had own interests in mind. Cognuse did convey the ideas of health care providers amongst actors, but this did not transpire into further deliberation.

Actors had varying interests in implementing the solution. The interest of Cognuse was to solve a widespread problem in health care and to profit from the implementation of the app. For the health care providers, there was an opportunity for executives of the relevant health care providers to increase the motivation of employees by demonstrating the commitment to the employees' welfare through supporting investments, possibility to increase treatment quality and reduce costs connected to mistreatment. Health care providers perceive the field of supporting digital equipment for conducting procedures to be underdeveloped, which has resulted in strong motivation to test new ideas. Governmental actors had indirect interest, only with regards to increasing treatment quality and solving the discrepancy problems with nursing procedure guidelines (I2).

The actors have been committed to seeing their ideas implemented. This has created problems with the CoNurse solution, as in practice it has been difficult to accommodate the varying ideas due to the limitations based on the technologies used. Although in isolated conditions the app worked as intended, in clinical conditions it faced considerable issues. These were connected to time lags, patient feedback and unresponsiveness of the app. The

feasibility of implementation has constantly come under tension, as the goals of the health care providers cause additional deviations in maximum operability. Health care providers have genuine interest to see a supporting tool for health care professionals implemented, but the limits of technical feasibility affect the possible opportunities.

Strategies to achieve societal support for the innovation

Politicians and administrative leadership provided limited support during the start and throughout the project. Cognuse did put some effort into gaining additional support through attempting to engage the Ministry of Social Affairs, the Health Insurance Fund and the Health Board. The governmental actors exhibited their support, yet they were not actively engaged in the project. Because of that, their support was limited to providing a relevant legislative framework within which it would be possible for Cognuse to operate as a private enterprise.

Support amongst health care professionals increased during the piloting phase, as Cognuse was able to engage in interactions with additional stakeholders within the health care sector. The problem was well-acknowledged within the health care sector, which caused actors to be more receptive to ideas. The introduction of the app and the positive feedback from interactions with Cognuse has resulted in an increased support, especially towards Cognuse, which has resulted in new initiatives being piloted and requested.

Media coverage of mistreatment did initiate some pressure towards health care providers that affected their consideration of existing practices. However, throughout the project, there was no communication with the media.

User involvement

The largest health care providers (NEMC, Tartu University Hospital, West Tallinn Central Hospital, East-Tallinn Central Hospital) in Estonia were involved in the project. The reasoning for Cognuse to engage the largest health care providers was the opportunity to engage actors who have the largest number of possible procedures available, enabling the solution to be tested in as diverse conditions as possible. NEMC was included already during the problem formulation to determine the problems and the needs of the health care sector and were

involved in constructing the initial vision for the project. Engagement was additionally reliant on pre-existing contacts within the health care sector.

For the health care providers, the incentives to participate in the project were connected to resource cost savings from mistreatment, increased quality of treatment and better oversight measures. Additionally, the project provided an opportunity for health care providers to provide more support for professionals and highlight the importance of employees' welfare as well as to support them. The tool would alleviate stress from decision-making in difficult situations and provide a safety net. The health care providers who were involved, are amongst the largest health care providers in Estonia and provide services to a large number of patients, which increases the possible risk of legal actions due to mistreatment, which therefore also increases possible cost savings from avoiding legal proceedings.

Health care providers provided knowledge regarding the modification and ways of digitalising usable guidelines, which needed to be different from the standard, bulky paper guidelines. Additionally, nurses provided an overview of the viable functionalities and the usability for the solution. Testing in clinical conditions provided an overview, how the device interacts during day-to-day operations and how it can be feasibly used. Cognuse took this input into consideration and they updated the solution accordingly. They have also acknowledged the limitations of the solutions, enabling them to be more selective in the future.

The engagement of nurses into the CoNurse project has been crucial in receiving feedback that has enabled a more functionable solution with which CoNurse has been looking to expand abroad. During the CoNurse project, about 120 nurses were engaged, and 70 guidelines digitalized. This enabled the utilization of the solution in real life conditions at a scale rarely provided to private enterprises. However, the feedback of the piloting departments within health care providers has limited the expansion of the solution within the same health care providers, as their evaluation has limited its expansion within piloted organisations. As a result, user engagement has been a successful process during the project, as it has enabled to formulate problematic areas that health care providers have and encompass a possible

solution for it. However, the usability of the solution itself has limited its further expansion based on the account of involved users.

The coordinator (Cognuse) did take into consideration the feedback the nurses provided regarding patients' reactions. This enabled them to make more concrete recommendations about the specific procedures and scenarios, where nurses should use the solution. However, there was no active engagement of patients, as the solution was aimed towards health care professionals specifically. Health care professionals highlighted the quick feedback received from Cognuse, when they reported errors with the solution. They also recognised the initiative to tackle a problematic field and improve the solution.

Role of ICT in the collaboration process

Basic ICT tools were used throughout the project and they maintained an important role. However, no specialised tools were used during the CoNurse project. Cognuse made use of google environment tools, emails and a Facebook group for information dissemination between project team members. Its role in day-to-day communication and problem-solving remained key for ensuring communication between Cognuse and the health care providers throughout the project. This was due to the physical distance of project team members and necessary flexibility regarding communication. It has become the standard mode of communication and success in a project requires successful use of ICT tools.

During the development process, the developer communicated with Cognuse through the use of Slack. However, its effect on the innovation process was limited, as it was a standard project management tool and was limited to few actors.

Success factors

Cognuse designed the constellation of the partnership to maximize their options during the process of implementation, but this provided marginal input for the innovation itself, as Cognuse engaged the relevant actors after the core idea was set, which affected the acceptance of their ideas and the novelty of their approach. The consideration for it was based on a compromise between technical feasibility, usability and costs, which Cognuse had to balance.

In Estonia, private initiatives face very difficult circumstances, as their opportunities to receive public funding are very limited. The Health Insurance Fund and Ministry of Social Affairs provide indirect support through designing a proper legislative framework enabling private entities to operate in the field of health care. The Health Insurance Fund provides no financial support to any initiatives. However, due to the limited size of the market, the limited resources of enterprises and the dynamics of health care providers and governmental actors, it remains very difficult to have viability, which disincentivizes further efforts.

Although the solution itself has been with mixed success, it has resulted in positive feedback from health care providers regarding collaborating with Cognuse and their leading role as a private sector actor. It has even spurred certain actors to request opportunities for additional collaboration with them.

It is additionally important to highlight that health care providers experienced strong pushback within their own organisations, as there were employees who were very critically minded, and it required careful selection of the professionals to be engaged in the pilot.

The importance of individuals is crucial within the Estonian context and this has affected the CoNurse project. The relationship between the CEO of Cognuse and the representative from the Ministry of Social Affairs has proved to be key in directing the progress of the CoNurse project. The power distributed to an individual within the Estonian administrative structure provides them considerable power in making decisions, as they tend to possess the sole competency within the field. As a result, relations between individuals become more important, as individuals possess considerably more power. This has been the case for the CoNurse project and has resulted in difficulties during the collaborative process.

The CoNurse project expanded at a very rapid rate between different health care providers in Estonia, which did create setbacks for the project, as they attempted to create a solution that would engender widespread acceptance. However, the coordinating actor, Cognuse, faced a disparity of ideas due to limited interactions between users, which led to uncertainty regarding the direction to take with CoNurse.

3.2.5. Polycare (Spain)

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Introduction of the project

The purpose of the Polycare Project was "to develop and test an integrated care model, patient-centred, supported by the use of advanced ICT systems and services that allows the monitoring and care of older chronic patients in acute phases at home". The project tried to achieve this objective by developing a collaborative website between stakeholders to facilitate the transmission of information, create personalized apps and patient wearables, and develop a decision support system.

The project focused on elderly chronic patients experiencing a flare-up of their illness. These patients need more complex services and some of them need continuous care and monitoring. The increasing elderly population in Spain has led to a surge in the number of patients with these conditions. The provision of healthcare services to these patients is more difficult due to the reduced mobility of elderly people that means higher costs (these patients require more medication and are hospitalized more frequently), especially in areas of high population dispersion. This project aimed to make it possible to receive this care at home to increase patients' comfort, improving the quality of the service and reducing the cost.

The partnership was part of a European H2020 project with a consortium of eight partners and implemented in Aragón (Spain), Bonn (Germany) and Lille (France). We focus our analysis on the development and implementation of the Polycare innovation in Spain. The reason for creating the partnership was the need for knowledge and experience in different fields (clinical and technological ones), as well as access to enough patients from different regions for the testing and validation of the results.

The project began in January 2016 and ended in December 2018 (three years). It established three phases two years of design and development of the innovations, one year of piloting and two months of evaluation. Diffusion activities were carried out throughout the project.

The project can be characterised as highly explorative because before this project was initiated, there were no technological solutions that allowed effective home hospitalization for older chronic patients in acute phases of their illnesses, although some of the technologies used already existed. There were deadlines, but these deadlines were modified to adapt to changing needs, as explained in the following sections.

The eHealth innovation

The innovativeness of the project was its use of advanced ICT systems to enable an integrated patient-centred care model to achieve home health care for elderly chronic patients in acute phases of their illnesses. The software and wearables necessary to monitor patients (e.g. chest bands to monitor respiration, physical activity, body temperature and to make electrocardiograms) were developed and existing devices (e.g. to monitor blood pressure and weight) were also integrated. A web-based platform to communicate and share information between healthcare and social care professionals was developed. This collaborative environment allows the provision of a more patient-centred service. A decision support system based on the use of artificial intelligence was developed to collect all the relevant information (from sensors and wearables and from healthcare and social care professionals) and to provide alerts when health conditions deteriorated or when adverse effects appeared because of drug interaction. An app was developed to be used with a tablet in order to promote healthy habits and educate patients about their illness and treatment through gamification. Gamification tools for the education of patients are not new, but their use in this project helped the healthcare staff to inform and teach the users about the new service.

Although some of the functionalities could have been possible with other existing technologies, the overall innovation could not have been obtained without combining the use of the technologies explained above. These functionalities are important, as chronic patients in acute phases need personalised treatment due to the complexity of the service they need (these patients require more medication and are hospitalized more frequently). Furthermore, the number of these patients has increased a lot in the last few decades, and it will continue to grow as life expectancy increases.

The innovation was not fully implemented due to the problems mentioned in the Network management and User involvement sections below. Furthermore, interviews with some of the project partners indicated that further developments in the sensors and wearables are needed for a safer use. Moreover, healthcare professionals recommended that the ICT systems developed be integrated with their usual computer systems to make their daily routines easier.

In our opinion, the innovation would be highly innovative if fully implemented, because users would not have been able to do the same with other tools. However, as the innovation was not tested in a real home hospitalization, it is not possible to assess whether the innovation has achieved its expected results and if it enhances collaboration between healthcare and social care professionals. The level of data sharing between healthcare and social care professionals related to patient conditions has in any case, improved, as this exchange of information between them did not previously exist. As such, the innovation achieved part of the objectives, but it needs further developments in order to make home hospitalization possible.

Partnership structure, governance and resources

The coordinating actor was Everis-Spain (a private company in the ICT and digital transformation consultancy industry that offers cloud apps for integrated care). The core partners were SALUD (the public healthcare system in Aragón, Spain) and Fraunhofer FIT (a German non-profit organisation that carries out R&D activities related to digitalization, industry 4.0 projects and IoT solutions). Secondary partners were Plux (a Portuguese private partner that develops advanced biosignal monitoring platforms that integrate wearable body sensors with wireless connectivity and software applications) and Interactive 4D (a French private partner that develops serious games and gamification e-learning tools for e-health and other areas). There were two other partners (the University Clinical Hospital of Bonn and Santelys) that did not participate in the development and implementation of the project in Spain. The Region of Somontano de Barbastro (local authority in charge of the Social Action area, among other powers, in this region of Aragón, Spain) was formally a partner but its participation role was closer to that of a user because it mostly participated to prove the utility and functionalities of the innovation in the test and piloting phase.

The most important resources in the project were ICT and human resources, together with process resources (access to patients in the test and piloting phase). ICT resources were mainly provided by Everis, Fraunhofer FIT and Plux. Interactive 4D also provided these kinds of resources but with less participation. Everis developed the collaborative platform. Fraunhofer FIT developed modules of the platform with advanced software components, such as machine learning algorithms for data analysis. Plux developed an integrated new device (chest band) to monitor the electrical activity of the heartbeat (electrocardiogram), respiration, physical activity and body temperature. Interactive 4D developed gamification tools for patients to learn about the use of the devices provided and their treatment. All the partners were equally important in providing human resources, although with different backgrounds. SALUD and the Region of Somontano de Barbastro provided healthcare and social care professionals and the other partners were more important for providing engineers and other technological professionals. SALUD and the Region of Somontano de Barbastro also provided the process resources (access to patients) needed for the piloting phase in Spain.

The project was mainly financed by the European Union as it was an H2020 project. However, a technological private partner said that they also provided a small additional part of financial resources. These funds were used to involve additional human resources to deal with changes in technology requirements that were not initially foreseen.

The partners could be divided into two groups: a) health and social care partners (all of the public partners) and b) technological partners (three private partners and one public partner). The importance of involving health and social care partners is that they have the human resources, along with health and social care knowledge and access to patients. Their motivation was to implement this innovation in their regions and obtain some rights to further develop the technologies that would allow them to be less dependent on other organisations (i.e. private firms). The importance of involving technological partners was their knowledge and experience in advanced ICT tools necessary for the development of the eHealth innovation. Their motivation was to further develop the technology in order to sell their services in the future.

The governance structure was formed by a steering committee with the participation of the coordinator and representatives of all the partners. This committee had at least one annual meeting. There were also monthly monitoring committees and extraordinary assemblies. The main coordinator of the project was Everis-Spain, but there were also other leaders, depending on the phase of the project. Everis and Fraunhofer FIT were the leaders in the technological phases and SALUD led the test and piloting phase in Spain. However, we consider that the partnership is governed by a lead organisation rather than being a self-governed network due to the importance of the coordinating actor's (Everis) activities when differences of opinions among partners emerged or when conflicts arose (i.e. partnerships governed by lead-organizations are dependent on this lead-organization to take crucial decisions in the partnership; Provan and Kenis 2008). The coordinator ensured that these problems resulted in agreements aligned with project objectives.

Network management

There were some differences in the partners' views, but none of them disturbed the collaboration process significantly. Firstly, there were differences in opinion between the technological and healthcare partners because of the different interpretations about technological needs and expectations. Secondly, there were conflicting opinions among the partners and some strategic behaviour regarding the intellectual property rights for the technology developed. On the one hand, the healthcare partners did not want to provide access to the private partner about patient information and their own services in order to develop a technology that they would need to pay for if they wanted to use it once the project had finished. On the other hand, the technological partners wanted to retain the intellectual property rights to maintain their competitive advantage. Thirdly, healthcare and social care partners worked with greater restrictions in terms of confidentiality (e.g. limitations with regard to data sharing with third parties or storing sensitive data on servers beyond their control) whereas technological partners wanted to have access to this type of data to develop the innovation and evaluate the market. Fourthly, the differences in the size of the involved partners caused strategic behaviour between some partners in order to obtain financial

resources more quickly or with less restrictions. Finally, one of the initial partners abandoned the project, so the partnership had to involve another partner (Santelys) in order to test the innovations in France.

In order to solve these differences in opinion, the partners discussed the different perceptions of problems and solutions and connected the ideas of different actors (e.g. by organising joint meetings, visits to the healthcare system facilities for the technological partners, and brainstorming sessions, in person and online). The partners actively pursued consensual solutions when conflicts occurred. There were also some activities related to the connecting strategy and process agreements. The coordinator mediated in the conflict to avoid deadlocks and defined rules for decision making and for the distribution of rights to innovations (process agreements). For example, the SALUD retained some rights to further develop the innovation without the involvement of the technological partners.

Dynamics and activities in the innovation process

The ideas in the innovation process emerged due to the interactions between partners with different knowledge and expertise. Requirements for sensors that were not initially considered were solved by communication between healthcare professionals and the technical partners. The same thing happened when problems in the use of the sensors were detected or improvements were needed. Innovations were developed by the technological partners based on the guidelines provided by the healthcare professionals.

There was a delay in the innovation's design and development stage because of a mismatch between the technological requirements (initially underestimated) and the technological possibilities (initially overestimated). This delay reduced the expected duration of the piloting phase from 14 to 4 months. Moreover, because of security requirements, the piloting phase was carried out in a controlled hospital environment and not in a real home hospitalization. However, these problems arose because of the need for more rigorous consideration of these aspects in the planning stages of the process, rather than because of problems related to interaction among partners.

Great consideration was given to the feasibility of the ideas and those that were not technologically or clinically feasible were discarded. There were different stimuli for each partner to implement the ideas, but this caused no conflicts. Public partners wanted to implement the ideas in order to improve the quality of their services, while the technological partners wanted to improve their technologies in order to sell their services in the future.

Strategies to achieve societal support for the innovation

The most important actors to achieve societal support were the media, but they did not support the project very actively. They disseminated the information provided by the partnership and their support was more important during the implementation stage than at the beginning. Other actors within the healthcare sector also supported the innovation during the project (not initially). The project was extensively promoted through conferences, workshops and other events in the healthcare and technology fields. The partnership sought to determine its feasibility and obtain feedback from external parties. The partnership was also active in social media (Facebook, Twitter, LinkedIn and YouTube). The interaction with other stakeholders through these tools increased over time and helped them to obtain societal support. The partnership did not seek the support of elected politicians.

User involvement

There were different types of users: patients, healthcare professionals (physicians and nursing staff) and social services staff. They participated in different phases of the project and with different roles. All of them were informed about the project and how to use the technological tools. Furthermore, all of them provided feedback about the problems and possible improvements in the tool. Healthcare professionals participated in the design of the tools' functionalities and were consulted about the needs of the service and requirements of the tools. All the users collaborated and shared co-produced in the piloting phase. Healthcare and social care professionals selected the patients, provided the new service to them and monitored their evolution.

Involving users was essential for the success of the project. Advice provided by healthcare professionals was needed to develop technological tools that met service needs. Moreover, the collaboration of healthcare and social care professionals was needed to involve and monitor patients. The collaboration of patients was necessary to check the effectiveness of the technological solutions and receive feedback to solve possible problems.

Healthcare and social care professionals wanted to participate in the project because it was an opportunity to improve their services. Nowadays, they are suffering from saturation in these services and they consider that new ICT tools can solve this problem. Patients wanted to be involved because of the possible advantages of receiving care from home (e.g. convenience and no risk of nosocomial illness).

The healthcare and social care professionals provided their knowledge about patients' needs and gave feedback about the use of the technological solutions. Patients also provided feedback about the use of the technological solutions. The input obtained was registered in the project reports and was incorporated to improve the tools. The incorporation of feedback was possible in the design and development phase but not in the piloting phase because of the shortened time frame.

The user's participation in the design and development phase could be considered successful. However, it was rather unsuccessful in the piloting phase for different reasons. Although the project objectives were explained to users when the partners asked for their collaboration, some of the users did not know what was expected from them. There were different restrictions to patient selection and involvement. First, the variety of patient types initially sought was not enough, so the requirements were changed. Second, the sample of user participants was very limited due to time limitations. Third, the patients' health conditions limited the possibilities of obtaining feedback from them. And fourth, security requirements caused the piloting phase to be carried out in a controlled environment (a hospitalisation unit) and it was not possible to test the innovations in a real home hospitalization environment.

Users were in any case motivated to participate and their satisfaction with the innovation was analysed by the partnership.

Role of ICT in the collaboration process

ICT tools were systematically used to stimulate collaboration between partners and users. Basic ICT tools were used for communication between partners (such as emails and online videoconferences) but also more specific ones (such as an online repository to share information developed by Fraunhofer FIT). ICT tools for user's participation were used during the innovation process to involve user in particular phases of the process (e.g. testing).

The use of ICT was particularly relevant in the collaboration process because the partners were active in different countries and it facilitated their continuous communication to develop the innovation. The coordinator indicated that this project could not have been carried out without using these tools in the collaboration process.

The ICTs developed to achieve the purpose of the Polycare project facilitated user participation (e.g., to learn about the innovation and how to use the ICT innovation). No other ICT tools to obtain feedback from the users were mentioned in the interviews. To know the level of satisfaction of the users, the partners carried out a direct survey without ICT tools.

Success factors

Chronic patients require more complex treatment, especially when they suffer from more than one chronic illness. This frequently occurs in elderly patients. Coordination and collaboration between all the people involved in their care is essential, especially in acute phases. The care and treatment of these patients involves high costs because they require more medication and are hospitalized more frequently. Due to an ageing population, these kinds of patients are increasing in Spain and developed countries in general and are a major issue in areas with a more dispersed population. The innovation of this project, which aims to develop an integrated patient-centred care model to treat these patients from home, would involve improvements in service quality and patient comfort, at the same time as reducing service cost.

The collaboration process in this project had barriers due to the fact that the motivations of individual partners were not always aligned with the project objective. Some of them are quite common in innovation projects (e.g. intellectual property rights) and others were related to the financial consequences (e.g. financial expectations of the technological partners). However, these barriers did not seem to have a serious effect on the collaboration process. The participation of the coordinator to increase communication, mediate in deadlocks and define rules was necessary to overcome them.

More significant problems arose in the development phases of the innovation processes. Home hospitalization required more security requirements than initially foreseen as the correct monitoring of patients' biosignals is of utmost importance. The initial overestimation of previous technologies and their possible improvement caused delays in the design and development stage. These delays limited the number of patients involved and reduced the time available for the piloting phase. In addition, patients in the piloting phase were limited in providing feedback due to their health conditions.

The most important lesson learned from this project is that a rigorous analysis of security and a realistic estimation of the time needed to adapt existing technology or develop new tools is necessary when planning eHealth projects in order to avoid delays during the development stage. Also, issues related to intellectual property rights need to be clarified and regulated upfront to avoid problems between partners. Greater flexibility in the final deadlines would be useful in order to avoid hurrying in the final stages of the projects, which reduce the capacity of the partnership to test and evaluate the innovation.

3.2.6. Mastermind (Spain)

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Introduction of the project

The objective of the **MasterMind** project was "to make high quality treatment for depression more widely available for adults suffering from the illness by the use of ICT" (http://mastermind-project.eu). Collaboration by 23 partners framed in a European H2020 project was created in order to accomplish this objective.

There were four core Spanish partners participating in this project, belonging to four different Spanish regions. They decided to join forces and create a partnership to implement this project in their respective regions because they had similar needs and they could share their experiences. In this case study, we analyse implementation of the project in the Basque Country (Spain), since a private company participated in the development of the innovation in this region.

The result of the project was Computerised Cognitive Behaviour Therapy (CCBT) through a web application developed in HTML5 called "Overcome your depression" for distance treatment of mild and moderate depression.

The project had four phases, the first phase being the conceptual part of the project, and where ideas on how the service should work were created and alternatives were proposed and selected. The next three phases were part of the implementation and testing:

- The first phase was the design of the cognitive-behavioural therapy and the platform. The key aspects of the innovation were defined in this phase: e.g. the number of modules to be implemented, the contents and organisation of the different modules, and the elements to be assessed (evaluation of mental state, tests, etc.).
- The second phase was the technological development of the online platform and necessary software.
- The third phase was the integration of this platform into the information systems forming part of the Basque healthcare system, to be used by patients and healthcare professionals.
- The fourth phase was the piloting phase in which the online platform was tested.

The project in the Basque Country was mainly exploitative because it sought the creation of a new tool to integrate functionalities that already existed in a previous online platform for the treatment of bipolar disorder. This project was part of a European H2020 project, so the deadlines were rigid. However, the project partners had the time to solve the problems that emerged during its implementation and to make some improvements.

The eHealth innovation

The innovation in this project was a Computerised Cognitive Behaviour Therapy (CCBT) for patients with mild and moderate depression. It allows people with these illnesses to receive distance therapy, involving fewer face-to-face appointments with health professionals. The main component of the innovation is a web application developed in HTML5 called "Overcome your depression", which can be used through a computer, tablet or smartphone. By using this application, patients can receive therapy in six modules in the form of text, videos, images, graphs, etc. The application makes patients perform tests, which then serve to communicate the evolution of their illness to the health professionals. The health professionals check these tests periodically and receive an alarm if a patient's results are a cause for concern.

Although the Mastermind application changes the way the patient receives the treatment and the communication between patient and healthcare professionals, some periodical face-to-face meetings between them remain relevant. The tool also allows personalization of the service to some extent, as health professionals can adapt the treatment according to the test results and patients with difficulties in attending face-to-face appointments (those that live far from the health centre, with mobility difficulties, without any time, etc.) can access the treatment easily. It also allows the self-education of patients about their illness and treatment as a complementary function.

Other advantages of this innovation are that it allows collaboration between healthcare professionals and that it reduces the dependency on psychiatrists, who can delegate some tasks to other healthcare staff. The psychiatrist and psychologist collaborate with other health professionals to provide the service and interpret the results of the treatment. Moreover, some of the tasks could be done by other health professionals. The inclusion of the patients

in these therapies could be done by primary care physicians who usually have closer relations with patients. Nursing staff can provide the service at some levels, like informing the patients on how to use the platform and solve problems related with its use.

The healthcare professionals needed a communication channel to have a video conference for collaborative care and treatment of depression (ccVC). This channel needed to comply with the security requirements of each partner, so ccVC was conducted with each partner's pre-existing internal communication system. Lync Server was the communication channel used for ccVC in Osakidetza. The advantages of ccVC are that primary care teams are more empowered in the treatment of depression, the reduction in the number of patients referred to mental healthcare units and an increase in the quality of service provided to patients[23]. Healthcare professionals of Osakidetza used ccVC when a complex case was identified, to receive advice by other physicians about those patients and to agree on a schedule for their treatment and any other additional communication needed.

The innovation is not totally new because users could find other tools that would allow them to follow treatment in a similar way and they could make use of offline cognitive behaviour therapy. However, this application is the only one allowing online treatment by using just one tool. It simplifies the learning process. Therefore, it might increase the number of physicians recommending the use of the online tool and reduce the number of users giving up the treatment. In the piloting phase, the innovation was restricted to patients with mild and moderate depression, those that know how to use computers, smartphones or tables and could access the internet. These limitations could reduce its frequency of use (the number of patients that can use the tool). However, the increase in internet penetration and the increase in ICT-related knowledge by the population are reducing these limitations.

The technologies included in this innovation are a website, a CMS (content management system), multimedia content and an app. It also needs other software that has already been

[23] There was a change in the appointment method based on a periodic schedule to one of personalized appointments based on the extra information and on the monitoring carried out by the primary care teams; both primary care physicians and psychiatrists have more information about the patients and their pathologies are monitored more deeply and closer than before.

used in the healthcare system to share information and hold videoconferences between health professionals and patients. These technologies are commonly available and have been used previously in similar projects. However, they are important in the innovation because they allow remote access to treatment.

The innovation was implemented in the piloting phase, but Tekniker owned the application. Osakidetza (the public healthcare system in the Basque Country, Spain) decided to develop their own application with the same content to make it more integrated in their systems and avoid the cost of paying for its use in all Osakidetza health centres. The innovation is complete, and the functionalities developed could be used for the treatment of other diseases, so it could have further developments. One of the problems that have to be considered is the possibility of patients behaving opportunistically, falsifying the test results to intentionally generate an alarm in order to talk to a psychiatrist.

The innovation has been a success because it has served to successfully treat a lot of patients and health professionals think it is useful. It does not completely replace health professionals but serves to reduce referrals to mental health professionals who are able to devote their time to patients that really need it. It is an additional tool for the treatment of mild and moderate depression, but traditional treatment is still needed.

The performance of the innovation is high because it has achieved its objectives and its limitations should be reduced over time. It helps to solve four problems of the Spanish healthcare system (a lack of physicians, population dispersion, overuse of drugs and financial sustainability).

Partnership structure, governance and resources

The coordinating actor was **Kronikgune** [24] (a public research institute of excellence on chronicity, registered as a non-profit association, which belongs to Osakidetza). The core partners were public institutions: **Osakidetza** (the public healthcare system in the Basque Country, Spain), **SALUD** (the public healthcare system in Aragón, Spain), **Badalona Serveis**

[24] Kronikgune is part of Osakidetza, but its participation was different because Kronikgune was in charge of project management (coordinator).

Assistencials S.A. (BSA, a public organisation providing health services in some municipalities in Catalonia, Spain) and the **Conselleria de Sanida de Galicia** (the public healthcare system in Galicia, Spain). **Tekniker**, a private technological centre in Spain was also part of the partnership (the development of the online platform was outsourced to this private actor).

Human resources, ICT resources and process resources (access to patients) were the most important resources for the project. Human resources and process resources were provided by the four core partners. Tekniker provided the development of the online platform and Osakidetza provided the ICT services for its implementation in Osakidetza systems. Tekniker wanted to develop a platform for the treatment of depression and prove that it was generic enough to be used for other purposes. Tekniker provided the human resources for this task.

The collaboration of Osakidetza, SALUD, BSA S.A. and the Conselleria de Sanida de Galicia allowed them to share the human resources for the design of the platform and the preparation of its content based on experience from difference healthcare systems. Moreover, they were able to share experiences regarding the implementation of the same therapy in each region. This collaboration allowed them to save resources, develop a better platform and improve the validity of the results. This innovation provided the partners with a tool to improve the quality of their services and reduce the cost of the treatments.

The financial resources were externally provided by the European Union (due to the participation in the H2020 project), except for the cost of the human resources necessary for its implementation in the Basque Country, which was co-financed by Osakidetza and the European Union.

Osakidetza and Kronikgune provided process resources (access to patients and legal knowledge to resolve the issues of copyrights and confidentiality of information). Osakidetza also provided the users (healthcare professionals and patients) needed for the piloting phase in the Basque country.

The governance structure was a project team of psychiatrists, psychologists and managers composed of representatives of the four regions (core partners). The coordinator was Kronikgune. The partnership worked like a self-governed network (Provan and Kenis 2008).

The project team met regularly, and its members interacted on an equal footing, although the opinions of those partners with more experience and/or resources had more importance. The success of the network was based on the commitment of all the partners: all the core partners needed to participate to prepare the content and to test the solution in the piloting phase, and Tekniker provided the online platform.

Network management

There were no conflicting opinions between the partners and there was no strategic behaviour between the partners. The perspectives of the partners were very closely aligned to the objectives of the project and some of the partners had previously been working together in other projects. Moreover, in the piloting phase, there was enough flexibility to adapt to those patients selected and how intensive their involvement might be, depending on the specific conditions in each region (e.g. different legislation, procedures or availability of staff).

Some differences in organisational cultures have been pointed out by the interviewees. The technical language used by technological staff and healthcare professionals caused some initial misunderstandings, but once they understood each other's perspectives, their interactions led to better solutions. There were also some tensions due to the differences between the ways in which the private and public actors were used to working. The private partner was used to working on a project basis (billing project hours) while the public healthcare partners worked on a process and results basis.

Other problems were the lack of technical knowledge for the development of the online platform, which is why Tekniker was included in order to develop the platform and help to integrate it in the Osakidetza computer systems. Indeed, the lack of experience caused the failure of the initial design because of interoperability problems between the online platform and the rest of the ICT systems. This caused some delays in implementation, and frustration among the physicians.

There were no formal rules to resolve these complexities. The complexities were resolved on an ad hoc basis, by organizing the necessary meetings (with an agenda of the topics to be discussed). Interaction between partners took place in these meetings, and collective and

integrated solutions were sought, without undermining opposing positions. The initial alignment made it easy to harmonize the different points of view. The central aims of these efforts were to explore different perceptions of problems and discover new possible solutions by connecting the ideas of the different actors.

Dynamics and activities in the innovation process

The ideas in the innovation process emerged from interactions between the partners in order to solve their respective problems. The combination of knowledge in a multidisciplinary team fostered this process, as did the inclusion of partners with different levels of experience. For example: (1) there were improvements within the initial protocol because of the experience of some partners, (2) there was a possibility of providing a first level of care by using nursing staff instead of psychiatrists or psychologists (reducing the cost of the service and the waiting lists) and (3) solutions to the similar barriers/problems of the partners were proposed in the piloting phase.

The partners looked for similarities between ideas when they were different. There were partners who initially disagreed in some situations (e.g. selection of the number of patients needed for the piloting phase), but there was usually a convergence towards the solutions proposed by the most experienced partners (e.g. Badalona and Osakidetza). The initial alignment of all the partners towards the project objectives also avoided an inevitable confrontation of ideas.

The partners were committed to implement the ideas and believed that these ideas were feasible. There were different stimuli for each partner to implement the ideas, but this did not cause any problems. Public partners wanted to implement the ideas in order to improve the quality of their service, but the private partner wanted to improve the online platform in order to increase its competitive advantage and use these improvements for the treatment of other types of patients (other markets/diseases).

Strategies to achieve societal support for the innovation

The most important actors in achieving societal support were actors in the healthcare sector, the general directors of Osakidetza and healthcare professionals. The general directors gave the normal support for innovative projects and the healthcare professionals increasingly supported the project once the innovation had been presented at the beginning of the project. Their support was in any case essential to obtain access to users for the piloting phase.

The partners did some presentations and attended some regional congresses to obtain support and feedback. However, they did not seek the support of either elected politicians or the media because they did not want to create false expectations.

User involvement

There were two types of users: patients and healthcare professionals (psychiatrists, psychologists, nursing staff and primary care physicians). In the first phases, the partnership collaborated with a small group of psychiatrists for the design and validation of the therapy and the online tool. Next, some psychologists joined the project to continue working on the design and validation of the online tool. In these stages the psychiatrists and psychologists were consulted by the partners, advised the partners and collaborated with them.

The other healthcare professionals started collaborating at the moment of the patient recruitment for the piloting phase and were also involved throughout the piloting phase. There were around 75 professionals involved. The patients were informed about the project and its objectives and their collaboration started when they accepted the treatment in the piloting phase. Users collaborated in the piloting phase by giving and monitoring the treatment (healthcare professionals) or receiving it (patients) and giving feedback to improve the online tool.

A treatment for patients with mental illness implies that physicians have less control over the effects of the treatment and over the patient's situation when receiving the treatment. We believe there were two main reasons to involve healthcare professionals: their advice was needed to develop a validated online tool and to they were also necessary to involve the correct patients and supervise the treatment. The involvement of patients was also necessary

for two reasons: 1) to check the effectiveness of the online tool and 2) to receive feedback to solve possible problems (e.g. usability of the online tool, usefulness of the contents and treatment received, etc.).

The suggestions and requests of users were sent to Kronikgune. Those that were compatible with the quality and security of the service and feasible in terms of cost and time were implemented. Interviewees have in any case indicated that there were no big changes to the platform. Interviewees confirmed that there was room to introduce improvements, although respondents indicate that in later stages of the project user involvement was quite rigidly structured because of the fact that the objectives, deadlines and type of patients to be involved were already defined. For example, at the beginning of the piloting phase, the psychiatrists received an email every time patients completed a questionnaire. This process was not sustainable because of the large amount of emails that psychiatrists received. Based on psychiatrists' complaints, a 24-hour contact centre was established. This centre was composed of nursing staff and served as a filter; i.e. emails were only sent to psychiatrists when relevant. This contact centre provided services to patients and healthcare professionals in case the online tool did not work properly, or the patients had doubts about it or the evolution of their treatment/illness.

Healthcare professionals were involved in order to improve the quality and efficiency of the service (reducing the number of face-to-face sessions and improving their psychoeducation), and to receive an additional tool to carry out their work. The incentive for patients was the possibility of self-administration of treatment, anywhere and anytime.

The users fulfilled the expectations of the partners. Healthcare professionals were quite closely involved but, the expectations regarding the number of patients who collaborated were not achieved and some patients abandoned the treatment.

The involvement of users in this project can be considered a success. Healthcare professionals were motivated to participate because they believed this tool was necessary and had some advantages: it was sufficiently well-designed for primary care physicians to use it (not only mental health specialists) and the participation of other regions in the project increased its

validation. Patients had the possibility of being more actively involved in their treatment, progressively learning about their illness, avoiding visits to healthcare centres, avoiding waiting lists for face-to-face treatment and receiving a more continuous treatment.

However, there was room for improvement in terms of healthcare professionals' participation. The lack of communication between partners and users about the effect of the user feedback on the final solution and the general results of the treatment for the whole of the sample may reduce the motivation to continue their participation during the piloting phase. The performance of the online platform and how the feedback obtained is used should be regularly communicated to health professionals participating in the piloting phase, not only at the end.

Role of ICT in the collaboration process

The role of ICT for collaboration in the partnership was mainly directed at increasing communication between the partners, the sharing of information and joint analysis among the participants (partners and users) in the project.

The partners in this project used videoconferences and a multi-platform, cloud-file hosting service because the partners were from different regions. They used these tools communicate, share information and make joint decisions.

There was a European platform to centralise the data and provide it to all the partners. Moreover, Osakidetza used Oracle Business Intelligence, software that facilitates the collection, processing, analysis, and presentation of data.

Success factors

The innovation and collaboration process was very smooth. There were no significant barriers that inhibited the collaboration process. Some partners had collaborated previously in other projects and their perspectives and ideas were very much aligned with the project objectives. Partners behaved correctly in the collaboration process, as they attempted to align opposing interests rather than directly reject or disregard opposing ideas, being willing to share relevant information, and constructively trying to solve the problems that other partners

communicated. However, the coordinator indicated that there was no active behaviour to spontaneously provide ideas for improvement.

In our view, it would have been better to include a technological partner as a core partner in this project. There was also room for improvement regarding communication with health professionals during the piloting stage, lack of patient involvement in the first stages of project development and inadequate consideration given to compatibility issues with pre-existent ICT systems. Patients only participated in the test and piloting phase. Their inclusion was limited to this late stage because of the complexity of the health service. However, a small group of patients could have participated in the design of the tool (not the therapy) to obtain initial feedback about possible problems related to its use. Communication with healthcare professionals during the piloting phase could have been increased to avoid their lack of confidence in the innovation. When designing the ICT tool, an exhaustive analysis of the pre-existing ICT systems needs to be carried out to avoid interconnection and compatibility problems. In this case, this analysis was not exhaustive enough and interconnection and compatibility problems caused some delays in the established deadlines and might have limited the time to develop the ideas that emerged during the innovation process.

The context of the healthcare system in which this innovation was implemented, has to be considered for a correct evaluation of the innovation's importance. In the Spanish healthcare system, there is a general lack of physicians in some medical specialties. This innovation makes it possible reduce dependency on psychiatrists for this type of treatment because part of the treatment could be conducted by the actual patients or by other professionals (e.g. nursing staff or general practitioners). The dispersion of the population in Spain also makes it difficult to ensure accessibility to healthcare services in the whole country and this innovation allows remote treatment. The number of people with depression has increased in the last decade in Spain and all around the world and so has the amount of medication taken by patients to remedy this. The Mastermind innovation provides another possibility to receive cognitive behavioural therapy, a therapy that could avoid treatment with medication in some cases.

The most important lessons learned from this project are the importance of including partners that provide all the essential resources, a good alignment of all the partners with the project objectives and continuous communication with the users involved. Before a partnership is created, the individual objectives of each partner should be carefully considered to ensure that they are aligned with the objectives of the project and to ensure their active participation in the project. Communication activities with users should be carried out throughout the duration of the project in order to achieve support for the innovation and increase the chances of full implementation and use of the innovation. Finally, the involvement of partners with different levels of expertise helps to acquire new perspectives on the problem and might also help to disseminate the innovation.

3.2.7. Track AI (Spain)

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Introduction of the project

The objective of the Track AI project (https://dive-medical.com/TrackAI.html) is to incorporate artificial intelligence (AI) into the DIVE medical device[25] so it can *"estimate the probability of the patient having a certain pathology"*. The innovation was created due to the difficulty in exploring the visual function (e.g. vision) in children, but it can be used for both collaborative and non-collaborative patients (i.e. patients who are able to collaborate with physicians as opposed to patients – such as children – who are unable to collaborate with physicians). The partnership allows technology to be shared between organisations and combines the experience of organisations in the health and technological fields.

Three core partners were involved in the project: **DIVE-Medical S.L.** (the coordinator, a Spanish start-up which developed the DIVE Medical Device and which includes paediatric ophthalmologists from the Miguel Servet Hospital (Zaragoza, Spain) and engineers from the

[25] Device for an Integral Visual Examination, a medical digital device for a fast and accurate exploration of the visual function of non-collaborative patients

University of Zaragoza), **Huawei** (private partner, international provider of ICT solutions) and **IIS Aragón** (public partner, health services research centre in Aragón). Some other organisations were also involved in the project, but with a lower level of participation: DIT Studio (a private software development company from Thailand) and five hospitals (public and private) from different countries (Spain, China, Mexico, Russia and Vietnam).

The collaboration officially started in November 2018 and ended in December 2019. The development phase took place from November 2018 to March 2019 (protocol development, development of the innovation and planning of the test and piloting phase). The selection of patients and testing in the Miguel Servet Hospital and the contacts with other hospitals started in April 2019. Patient selection and piloting in the five hospitals involved, continued until September 2019. From September to December, the partners started analysing data and continued with patient selection to complete the targeted number of patients. The full analysis of the results began in January 2020.

Track AI is an exploitative project in the sense that it improves upon previous technology by using AI in order to link gaze patterns to specific visual disorders and provide healthcare professionals with an estimated probability of the patient having a certain visual disorder. The innovation process and piloting phases were highly structured and the core partners in the project were focused on timely implementation of the project and insisted on compliance with deadlines and established requirements.

The eHealth innovation

The innovation in this project consists of the development of a specific app that uses AI in a Huawei P30 mobile phone in order to analyse data from visual explorations using the DIVE-Medical device. This innovation helps physicians to determine whether or not a patient has a visual impairment by comparing patient gaze patterns with the database generated by previous diagnoses (which can be accessed online and offline). In some cases, it also makes it possible to estimate the probability of a particular pathology. The project is focused on non-collaborative patients, but it can also be used in collaborative patients (i.e. patients that are

able to collaborate with physicians as opposed to patients – such as children – who are unable to collaborate with physicians).

The innovation can be adapted for different types of patients, although the tests used are predefined. The innovation increases collaboration between healthcare professionals because the database is fed by the visual exploration performed by all healthcare professionals who use it. Moreover, other healthcare professionals (other than ophthalmologists) will be able to use it in the future and communicate the results to the ophthalmologist if visual disorders are detected.

These functionalities are important because there is a shortage of ophthalmologists in many parts of the world and the possibility of carrying out a visual exploration without the need for very specialized knowledge (in the form of specialists) will be very useful. It can prevent patients making unnecessary visits to specialised medical centres and allow ophthalmologists to spend more time with patients that really need it.

The DIVE-Medical device (made up of a *"high-resolution touchscreen for visual stimuli display, an eye tracker to capture the patient's response to those stimuli, an indirect light to run the tests in a controlled environment, and an ergonomic adjustable case designed for optimal positioning of the device"* [26]) was already developed, but a further development of the software was needed to implement this innovation. The technology used in this device is not rare and there are other tools for visual exploration, but this device has far more functionalities. The innovation could not have been developed without this device.

The use of AI is relatively new. This technology is spreading fast and becoming increasingly important in all sectors although the characteristics of the software and hardware used are not rare and could be replaced by others. However, the use of this AI with the purpose described above is completely new. Other ongoing innovation projects in the health sector are using AI in order to make recommendations to healthcare professionals (e.g. the HIKARI project at Fujitsu Spain and the HCSC Innovation Unit at the Institute of Sanitary Research in

[26] https://dive-medical.com/products.html

Madrid). However, this is the first time that AI has been used to analyse data in visual explorations. Furthermore, a major focus of this innovation is the evaluation of non-collaborative patients (e.g. children). It was easy to disseminate the innovation because the technologies used are not rare and it will allow the analysis of visual disorders in patients for less specialized professionals. These advantages will make it possible to improve health services in both developed and non-developed countries.

The innovation has already been developed and tested. Interviewees affirm that it will be improved once they have analysed the results of the piloting stage and further developments are carried out.

Partnership structure, governance and resources

According to the coordinator, the most important resources in the project were human resources because of the need for health and technological knowledge and experience to develop the innovation. DIVE-Medical S.L. was the most important partner providing these human resources as it supplied the physicians and engineers with specialized knowledge in this health speciality and technology. Financial resources were provided by Huawei. ICT resources were mainly provided by Huawei and DIVE-Medical S.L. Huawei provided computers and mobile phones and part of the AI software. DIVE-Medical S.L. also provided the DIVE-Medical device and its associate software. DIT Studio was subcontracted for the development of part of the AI software. ISS Aragón provided processes and human resources, as the participation of ISS Aragón (public partner) made it easier to obtain funding. Furthermore, ISS Aragón has provided legal and managerial knowledge and the possibility of contracting external human resources. The five hospitals provided the users for the test and piloting phase.

DIVE-Medical S.L. had already developed the DIVE medical device in previous projects. This project incorporated Huawei AI technology, using its HiAI platform and Huawei P30 smartphones to analyse the results obtained using the DIVE-Medical device. DIT Studio was subcontracted to develop a specific part of the software because of the lack of advanced knowledge about AI.

DIVE-Medical S.L.'s motivation to participate in this project was especially to further develop the functionalities of the DIVE medical device. Huawei wanted to prove the use of its AI technology in the health sector and obtain recognition with this innovation. IIS Aragón was involved because DIVE-Medical S.L. is made up of physicians and engineers belonging to a research group in this institute. DIT Studio provided its services to obtain income and the hospitals participated in order to learn and implement this technology to improve the services provided.

Medical and engineering teams were responsible for project management. The project coordinator was also the medical team coordinator. These teams met on a weekly basis and the coordinator participated in both meetings.

The collaboration was led by the project coordinator. Most of the communication with the different partners was carried out by the coordinator, as was project management and decision-making. ISS Aragón also participated in the negotiation and drafting of the collaboration agreements between DIVE-Medical S.L. and the other partners due to its legal and managerial knowledge. The partnership was governed by a lead organization (Provan and Kenis 2008).

Network management

There were no major conflicts between partners. There was only an initial lack of communication between healthcare professionals and engineers and there were disagreements between them due to knowledge limitations about each other's specialization/expertise fields. The health and engineer teams had weekly meetings and ad hoc meetings were also held to solve specific problems between members of those teams.

The strategy followed was based on process agreements initiated by DIVE-Medical S.L. Dive Medical S.L. and ISS Aragón were involved in concluding all agreements, the other partners being involved in those which affected them. Relationships between the partners and their participation in the project were defined in the contract and rules dealing with interactions between partners were established. Because of the highly contractual nature of the project, the public procurer can be considered to be the lead organization which governed the

partnership and took the crucial decisions (Provan and Kenis 2008). The shortage of specific knowledge about AI was overcome by including a new partner (DIT studio) that participated in developing part of the software.

Dynamics and activities in the innovation process

The initial ideas for Track AI emerged from the different knowledge and expertise (health and technological fields) of the partners and the interaction between partners that facilitated knowledge transfer. The actors looked for similarities between the ideas when there were different opinions (e.g. to find a specific diagnostic protocol), but there were not many disagreements because the objective and processes in the project were clearly defined from the very beginning.

The partners were very committed to implementing the ideas. The ideas that did not seem to be feasible or that deviated from the aim of the project were discarded because the duration of the project was quite limited and the different phases were rigidly established.

Strategies to achieve societal support for the innovation

There was societal support from the beginning of the project, and this societal support increased during the project. The most important actor in achieving societal support was the media, both at national and international level. This project was widely covered from the beginning. This diffusion was encouraged by the presentation of the project in the 2019 Edition of the Mobile World Congress and other events supported by Huawei. The collaboration with a well-known partner such as Huawei facilitated the partners to achieve media support. Huawei gave the partners the opportunity to present the project at international ICT congresses like the Mobile World Congress. Newspapers and ICT blogs about the project emphasized the collaboration with Huawei by explaining the possibilities of Huawei's technology. Other actors in the health sector (e.g. ophthalmological associations) helped to achieve societal support, but with far less impact and only once the project started. The partners made presentations at scientific congresses to obtain this support.

User involvement

There are two types of users in this project: healthcare professionals (ophthalmologists and optometrists) and patients of five hospitals in different countries. All the users were informed by the partners about the characteristics of the innovation and how to use it. Healthcare professionals from the Miguel Servet Hospital collaborated throughout the project and were consulted and advised by the project partners. Healthcare professionals from the other hospitals and the patients collaborated with each other in the testing and piloting phases.

The involvement of healthcare professionals was necessary because health knowledge and experience was crucial to design the tool and to define a user's protocol for patients. Health care professionals were also needed for the test and piloting phases, namely for patient selection, use of the innovation, and evaluation of the data obtained.

Patient collaboration was needed for the test and piloting phases. The partners needed a large sample of patients from different countries to validate this tool. The failures detected by users were solved and their feedback and suggestions were recorded and implemented whenever possible (e.g. changes in the tests used, the classification of some parameters as normal or not).

Collaboration agreements between the core partners and hospitals were needed to involve them in the project. The collaboration of the hospitals was very rigidly defined in the corresponding collaboration agreements: the same procedure had to be used for all the patients and the deadlines for data collection and subsequent submission to the coordinator were very strict to finish the development of the tool and its validation on time. These requirements caused difficulties in finding hospitals willing to participate (e.g. a hospital in Saudi Arabia could not participate in the end because it was not possible to agree on data sharing).

Hospitals participated in order to implement this innovation in their own organisations. The ophthalmologists in these hospitals wanted to be involved in the project because the technology presented a possibility to make their work easier and improve the quality of their services. The ophthalmologists also hoped to be able to delegate tasks to other healthcare professionals by using this innovation. The patients involved wanted to participate because

the project presented an opportunity to obtain a diagnosis of their own visual problems or a chance to help other children that needed the innovation.

User involvement in this project has been a success. The partners involved the ophthalmologists to ensure their motivation by developing the necessary tools to provide them with continuous communication to resolve their doubts and problems with the innovation. Motivating users to be involved in the project was important to achieve the final purpose of the project and its diffusion. The main difficulty in involving ophthalmologists was that they needed to combine their participation in this project with their normal work at the hospitals. Not involving patients in previous phases was justified in this project because these patients were children and knowledge and experience about their disorders and treatment was provided by ophthalmologists and staff at DIVE-Medical S.L.

Role of ICT in the collaboration process

ICT was systematically used for communication between partners (email, videoconference, tools for sharing information and data and a purpose-built communication app) and to facilitate the participation of hospitals. The partners developed a purpose-built app for physicians at the different hospitals to communicate with engineers in Spain to solve any problems identified in the Track AI test and piloting phase. Physicians did not participate in the development of the first version of this communication app and this caused some problems with its use because of its engineering orientation. The partners solved this problem by involving users in the development of the second version of the communication app. This app was not part of the end result of the project and was merely a means to support communication between partners.

In order to validate the innovation, the partnership needed each hospital to have a sample of patients with specific characteristics. An auxiliary algorithm was developed to check whether the patients proposed by hospitals fulfilled the requirements to be included in the test and piloting stage.

These tools were essential for the project because the hospitals were part of countries with very different cultural traditions and legal requirements, and specific knowledge was

necessary to solve the problems with the use of the innovation in each country. Users were involved in the design of these tools to ensure their usefulness.

Success factors

The collaboration processes in this project have been smooth as the objectives and participation of all the partners were perfectly defined in the contract. Conflicts in the innovation process were restricted to the differences in knowledge and experience between healthcare professionals and engineers. However, these were minor conflicts that have not affected the performance of the innovation process. Lack of knowledge in small parts of the innovation process was solved by subcontracting an external company. Focussing the project on just one objective in order to develop a specific innovation could have made it easier to align the goal with the efforts of the participants in this project.

The participation of users in this project was possible because of agreements with the hospitals that facilitated the access to enough patients. These hospitals mainly participated in the test and piloting phases and did not have any right over the developed technology. Their collaboration has been critical to obtain enough patients to validate the innovation in the future. Some difficulties arose during their participation, particularly due to data sharing issues because of differences in confidentiality laws that make it difficult to involve users from some countries.

The use of ICT to facilitate the participation of users in this project is remarkable. The development of an app (with the participation of the actual users) to allow for continuous communication between users and engineers has avoided possible problems and frustration in the test and piloting phases.

The innovation developed has advantages that go beyond the project's objective. If the technology is validated it will allow reduced dependence on ophthalmologists in carrying out visual explorations of patients. This innovation will help to reduce the shortage of ophthalmologists in many countries and facilitates access to this health service for many patients. Furthermore, it might help to reduce the cost of the service.

The most important lessons learnt in this project are the importance of defining an objective, flexibility to seek the knowledge needed in the partnership and communication with users. The definition of a clear objective and a specific innovation have contributed to making the innovation process easier and faster. The inclusion of another company when new knowledge was needed facilitated the design of the software. Continuous communication with users in the piloting phase of an innovation is essential to ensure correct functioning of the new technology and take advantage of the feedback generated.

3.2.8. OZO Verbindzorg (the Netherlands)

Erik-Hans Klijn and Vidar Stevens, Erasmus University of Rotterdam (EUR), the Netherlands

The case of OZO Verbindzorg concerned the creation of a tool which supports social neighbourhood teams. These neighbourhood teams support citizens in their daily activities. The OZO Verbindzorg case was part of the case studies for TROPICO Work Package 8 (WP8). However, because of the clear connection between our case selection criteria, and the content of the case, we decided to extend the data collection to conditions relevant for WP7. Although the case is part of WP8, we were able to use a lot of the insights from the case for WP7. The case description itself is however included in Deliverable 8.1 of WP8[27]. We refer to this deliverable for the OZO Verbindzorg case.

3.2.9. Smart Dementia project (the Netherlands)

Erik-Hans Klijn and Vidar Stevens, Erasmus University of Rotterdam (EUR), the Netherlands

Introduction of the project

The project concerns the development and testing of a tracking technology which allows the possibility for dementia patents to walk around more freely. The whole process is organized

[27] See D8.1 of work package 8 of TROPICO: https://tropico-project.eu/publications/

and managed by Tante Louise, a large care organisation that has several departments in different locations (in total, Tante Louise has more than 1100 residents, mostly elderly people above 80 years old). The eHealth technology (a wristwatch and app with which the whereabouts of the patients can be traced) is used to provide elderly people with Alzheimer with more freedom. The technology enables the nurses and the institution to trace the elderly better, thus giving them more freedom to move around. The technology fits in a policy of the organisation to work with life cycles. This means that a team decides how much freedom a specific patient can have. The aim is to grant as much freedom as possible, given the patient health and mental situation. If people can move around more, they stay fit longer both physically and mentally, the organisation argues. The organisation also emphasizes that the ICT tool is above all a supportive tool and that the most important element still is the (risk) assessment of the patient.

There was a public-private partnership between the ICT provider and health care organisation. The collaboration involved the joint product development, the implementation and the upscaling of the tool. The project started in 2014, in one of the elderly homes of the organisation (the organisation has several of these locations) and is still ongoing. Thus, the technology is used in more and more of different locations in the organisations.

The initial objectives for the project were:

- Better treatment for Alzheimer patients by increasing their mobility and movability within the nursing home.
- Increasing the freedom for elderly people in the institution, by means of innovative technology.
- Future-proofing the organisation. Given the growing aging of the population, innovations are crucial to keep the care affordable and possible.

These objectives did not change throughout the project. The project showed traces of both an exploitative and explorative processes. On the one hand, the innovation technique was already available and the process was rigidly structured. But on the other hand, the tracking technique was developed further and tested (especially for its practical use and the difficulties it for instance created for nurses and others who were involved in elderly care). Throughout

the project, new ideas were explored, and a trial-and-error approach was used to experiment with the findings. The project searched for creative solutions although the main elements of the innovative outcome were already determined at the start of the project. The emphasis was directed towards the creative discovery of the tracking device and not so much on the timely implementation of the concept. In general, the project was rigidly structured.

The eHealth innovation

The eHealth innovation was an example of how such technologies can support health professionals, as personal health data is collected, stored and communicated between relevant stakeholders. In general, in health technology, patient data is used to provide more precise and personalized health care (e.g. personalized interventions, predicating and preventing diseases). In this specific case of health technology, a mobile device, mobile sensor, and wearables were used to increase the health and wellbeing of users. This device with sensor technology helps Alzheimer patients to walk around more freely again in a nursing home and outside the nursing home through GPS tracking, which would otherwise be impossible for those suffering from dementia. In that sense, the ICT technology is important and vital for the innovation. But of course, the level of use still has to be decided by the nursing staff in each situation. This is exactly the discussions that emerge in almost each location where the technology is introduced (thus how much freedom can be allowed, how do we have to adapt our procedures for giving elderly more space, what are the risks, etc.).

The involved actors indicate several interesting observations about the innovations:

1. Involved people were usually positive about how much the innovation will be used (most respondents ranked it as a 5 on a 7-point scale)
2. About the effect on the user's life judgements most involved responds ranked it as a 4 which is not very high on a 7-point scale. This also shows when the majority of respondents indicate that the innovation probably not benefits all users but maybe more likely a subgroup (a 4 on a 7-point scale)
3. At the question how new these technologies are, a wide range was seen from 3-6. So, there was differences in perception on this
4. Most respondents did think that the ICT technology was important for the innovation process.

The ICT tool is fully implemented, but it still under development and also other nursing homes in the region experiment with the technology and the idea how much freedom is appropriate for people who suffer from dementia. These nursing homes especially debate to what extent it seems responsible and possible to give back freedom to Alzheimer patients, using sensor technology. The visions and opinions differentiate between those nursing homes.

Partnership structure, governance and resources

The project can be characterized as a relatively small but intensive partnership between a care organisation and an ICT provider/developer. Because of the size of the partnership (small), intensive communication was possible and the complexity was relatively low. The main actors involved were:

- Public actor: Tante Louise (coordinating)
- Private actor: Consyst (core partner) as the developer of the software
- User: Patient organisation of Tante Louise

The most important resources in the partnership were 1) the ICT-knowledge about the tracking technology (brought in by consist), and 2) financial and human resources. Tante Louise was the actor who brought in the financial resources; the financial resources could not have been mobilized in a different way than through this actor. Tante Louise was also responsible for human resources (knowledge about the care providing for elderly, knowledge about possibilities to use the tracking technology in different situations were elderly are in, etc. and the people employed in the care homes and their effort).

New developments and the use of care methods have to be reported to the Health Inspection who has to be in agreement. Interestingly, in this case the innovation started without the official approval of the Health Inspection (although the inspection was not negative about this). They simply agreed to wait until the innovation was developed further. So, there was explicit interaction with the inspection about this. Tante Louise got the official recognition by the Health Inspection after four years, so obtaining legal permission was one of the most important achievements for the project. According to the coordinator, the changes in the health care sector led to a more humane approach of patients with Alzheimer. The Dutch Law

was not yet adjusted to situations where Alzheimer patients were allowed to walk around freely by themselves without direct supervision.

These partners were needed in the project for the joined decision-making and co-development of the program. Without these actors, the innovation could not have been realised. Their collaboration and endurance ensured that nursing homes would be able to implement this technology.

The idea to use tracking technology on Alzheimer patients was not easy to implement as the Health Inspection did not approve this project from the start. This resulted in a situation where the partners had to work harder on the project to convince the Health Inspection and to show that the project had added value for patients. The main motive for Tante Louise to initiate this process of innovation was that Tante Louise had formulated explicitly to provide patients (also Alzheimer patients) as much as possible the freedom to go wherever they wanted. Tracking technology might help to realize this. The organisation also brands itself as innovative and front running. So, the project also not only fits in that image but also supports and communicates that image to the outside world. The main motive for the private partners (Consyst) was to be able to develop the system further. But there was also a clear financial motive since a normal contract was signed.

A steering committee was set up to guide the project. One lead actor organised the project and took the crucial decisions (i.e. the partnership was governed by a lead organization; Provan and Kenis 2008). This organisation (Tante Louise) was responsible for the administrative functioning of the partnership in addition to carrying out their other organisational responsibilities. Thus, power among network members was not evenly distributed, and it became critically important that the methods used to select lead organisations were viewed as fair within the partnership.

The project was initiated by the foundation Tante Louise (who, as mentioned, has several separate elderly care locations at different places which are part of the foundation) and who acted as coordinator. Tante Louise created the idea to use tracking sensors for Alzheimer

patients to give them back their freedom. The idea was created with two core partners: Patient organisation Tante Louise and Consyst, the latter being responsible for the ICT-knowledge. Together, they developed a pilot that was tested with users. From this pilot, user preferences were gathered and implemented to improve the design. The project is now up and running, and various regional nursing homes investigate whether they can integrate this program into their own practices as well.

Network management and activities in the innovation process

The project did not suffer from big conflicts between actors. The involved actors did not aim to reveal as much as possible different perspectives but stayed close to the initial plan. It was not attempted to integrate various ideas into the decision-making process as the technology and the core idea were already developed. Tante Louise (the coordinator) specifically searched for an ICT partner with similar views that would align with their vision. Complexities were not so much involved in developing the ICT tool as to use and implement the tool. It requires different behaviour of the nurses and other staff and the institution and communication with family and neighbourhood when elderly patients walk around in the neighbourhood. And it requires estimation and observations of possible risks and monitoring the patients.

Strategical behaviour did thus also not appear in the project. When the project faced deadlocks, the partners attempted to enhance the interaction between actors. The partners did not initiate new rules to harmonize activities but focused on shared decision-making processes. The working program showed a clear demarcation of tasks between the partners of the project.

There were some process agreements, since the project had agreed on a clear schedule from the beginning. The project involved arranging strategies as well. Most coordination was only done within the organisation of Tante Louise. So, extensive network strategies therefore were not really employed apart from:

- some connecting, thus intensifying contact when necessary during the implementation phase

- the contract and activities connected with that with the ICT partner; intensive connection here was necessary to feed the experiences of the implementation of the tracking tool back to consist and keep each other updated about expectations and interpretations of the contract.
- and some basic rules on how to supervise the ICT partnership and fix problems if they would occur.

The partners aimed at finding compromises and similarities between their ideas which was doable with only a few stakeholders within this project. For example, connecting the visions between multiple nursing homes (=different locations) was key to reveal various perspectives of how the project could work.

Societal support for the innovation

The whole project was strongly driven by Tante Louise as an organisation. Involvement of elected officials and outsiders of the organisation were very limited. Media attention was more important to generate societal support for the project. Tante Louise also communicated the innovative idea on their website and on several health conferences. Various newspapers and specialized health newsletters paid attention to the life cycle idea and the ICT technology. This on its turn helped to encourage the inspection to change it rules and regulation for societal and legal support. Thus, societal support was mainly generated by Tante Louise itself by 1) connecting to families of patients, and 2) actively promoting both their vison but also this project on their website.

User involvement

User involvement concerned both the involvement of the staff (nurses) who had to work with the app, but also in some cases the family of the patients. The new ICT system demanded a lot from the nurses. Users stated that there was a test-location and full commitment and financing support from Tante Louise. They also argue that the test-lab was organized by a highly involvement ICT partner.

Thus, there was no shortage of available information for the involved users. Some of the input from involved users was used to change the ICT set-up. So, there was room to learn and improvise in this project and a relatively high number of users were involved in the process. Users were thus successfully involved in a transparent manner, and their involvement provided insights for the ICT partner in terms of user experience. Interactions were intensive,

especially during the months of developing and testing (4-5 months), and this intense interaction was mentioned by several users as one of the success conditions.

Success factors

The coordinators at Tante Louise had a clear vision of what they wanted to create and based on these decisions, the project build on piece by piece. Further interactions between individuals did not change this core idea. There was little extra exploring maybe apart from insights that resulted from difficulties in the implementation process. In that sense, this was a relatively small and not too complex project.

The implementation process is considered as successful by most involved people in the sense that the tool works and allows the organisation and its employees to make different choices in the case of elderly people suffering from dementia.

The following success factors seemed to be the most important in this project:

- Intensive contacts between Tante Louise and the ICT developer
- Involvement of users (nurses and other staff) in the implementation process
- Clear commitment from the start, also at the management/director's level

3.2.10. Smart Diaper (the Netherlands)

Erik-Hans Klijn and Vidar Stevens, Erasmus University of Rotterdam (EUR), the Netherlands

Introduction of the project

The project concerns the further development of a Smart Diaper, as an innovation in elderly care. The system (Abena Nova, as Abena is the firm that developed the mechanism) is a sensor system. It consists of charcoal elements built in the diaper. A clip collects and sent the data to a central server. This sends messages to a smartphone and can be consulted online. The system was already tested by Philadephia (a care organisation) in 2015. Philadelphia and Abena further developed the system and connected Evean (an elderly care hospital), where it was tested further in two psycho-geriatric sections in 2018. The project was also part of a project of the Ministry of Health, Welfare and Sports called 'Care hospitals for the future'. The

test phase started in May 2018 and took 10 months in total. In this period, there was intensive contact between all involved actors, including the staff of Evean, who had to work with the new system and had to report back their experiences with the system and the (potential) pitfalls of the system. Also other users (patients) were involved, but the main feedback from patients was provided indirectly through the staff.

The initial goals of the project focused mainly on four aspects, which did not change throughout the entire project. These goals were:

- Increasing the health of patients
- Reducing the costs in cotton sheets
- Enhancing the control over the performance of nurses (management goal)
- Making the role of home-nursing future proof

The main results were increased and better care for patients who wear diapers by means of technology which helps nurses to manage their patients better and more efficiently/effectively.

The partnership implemented this innovation in nursing homes in 2018 and according to the evaluation of the results, the number of wet beds decreased by 76% due to the intelligent continence solution of the Smart Diaper. Thus, on average, the number of changes went down from 3.5 to 2.4 resident per day. This solution therefore contributes to the efforts to solve the problem of staff shortage in health care – which is one of the biggest problems of this time in the Netherlands. Moreover a 20% cost saving was measured on incontinence care, as well as a time saving of 28%. Due to these results, Evean Oostergouw was proclaimed 'career Innovator 2019' by the Ministry of Health, welfare and Sport in the Netherlands in January 2020. However, there were also some challenges and difficulties (see section 3).

The project started in March 2018 and ended in January 2019. There were actually seven concrete steps that structured the progress of the project:

- Step 1 was forming a 'petit committee', which was done to get to know one another. This phase was also used to generate ideas.
- Step 2 was finding support among the various participating stakeholders. Especially support throughout the organisation in Evean
- Step 3 focused on product development.

- Step 4 was determined to select nurses for the pilot-testing phase. Since the pilot started in the summer is was difficult to select experienced nurses in the process. Selection was done on the basis of availability and willingness of the staff.
- Step 5 was the pilot-testing week to gather feedback regarding the project. The testing-phase however did not lead to major changes.
- Step 6 was incorporated to evaluate the process and pilot-testing week.
- Finally, step 7 reserved time and space to carefully update the product before it became implemented.

Eventually the innovation (Smart Diaper) was implemented by Evean. According to the partners, the project was feasible within its timeframe. The fact that there were no environmental pressures that blocked the progress of the project helped the implementation of the innovation. Likewise, there were no regulatory constraints that caused difficulties during the development process.

The innovation process itself, was a mix between an explorative and exploitative process. It focussed on designed new ideas, generating and further developing a Smart Diaper. This led to a flexible and trial-and-error approach of the project with room for feedback and user-experiences. The partnership searched for a creative solution, which was however already determined at the very start of the project. This means that, from the beginning of the collaboration, the partners knew what they wanted in terms of the product. The how-question and the process-decisions, however, were dealt with during the project in close collaboration with the relevant partners and strategic stakeholders. Overall, the project was quite rigidly structured, and the aims were well-known at the start. The actual implementation and testing in two sections during the period May-December 2018 was relatively short and structured in terms of the allocated time.

The eHealth innovation

The ICT innovation tries to combine products from Abena with new technology from MediSens[28]. The Abena Smart Diaper is an intelligent continence aid for everyday use and is based on new wearable sensor technology. The 'Smart Diaper' is continuously connected with

[28] The diapers use sense technology, which is developed by another company, namely Medisense. This company was not really contributing to the partnerships or present in the partnership.

professional care-providers who are equipped with a digital sensor and wireless connection. The information about wetness levels of continence products is shared in real time with care-givers via an app on their mobile devices. The Smart Diaper thus provides personalized medical care services as the data that is used to provide more precise and personalized health care informs the nurses about their patients (e.g. personalized interventions, helps to predict and prevent 'wet/dirty diapers' and sick patients). The user can access and control the health of the patients through the innovation and health care services and the communication-interaction between users and health care providers is generally better facilitated by using the Smart Diaper.

The ICT tool itself is relatively new (e.g. data analysis tools, storage of data, etc. – the diaper provides this information). On the other hand, the technology itself is not very unique. This is confirmed by the fact that there is more than one application of this technology created by several companies at the same time. The technology in itself however was important for the innovation and also had consequences for daily services and work of nurses:

1. It helps users (care takers) in their job
2. But it also affects the way services are provided and choices are made. Thus, the simple fact that the information is there also changes the choices made during care. So, the ICT tool affects daily routines and habits
3. ICT tool also requires (intensive) communication in the care team (see the section on Network management below)
4. The fact that the ICT tool still had to be tested more also 'forced' the partners to collaborate. This is also one of the issues: if it is rolled out further and the support is less (because this pilot project was more intensive in this testing and guidance), how will it go?

Partnership structure, governance and resources

There were three core partners involved in this project. A public partner: Evean (coordinating) and two private actors: Abena, and Significant (a specialized change management agency). Evean is a large caretaker that is involved in intra mural care for elderly people (but also does care taking at home). The project took place at their location in Oostergouw (Zaandam) which is a care taking home for elderly people (in total space for 210 people). In general, this concerns elderly people that have psychological and physical problems and need extensive help. Abena is an ICT company which has developed the diapers and the app (and has been working on them starting in 2015). The diapers are an innovative product on which Abena has been working for a

long period of time and the project with Evean was part of this ongoing development. Significant is a consultant firm specialized in care, social domain, and justice. The company guided the change process and acted more or less as network manager. Philadelphia was a peripheral actor in which the first Smart Diapers were introduced. Philadelphia is a public health care provider which had a contract with Evean during the test/try-out phase (April 2018-December 2018).

Human resources (especially knowledge) was mainly provided by Evean and Significant. Evean was also responsible for the financial support of the product and within the context of this project, it was not possible to finance the Smart Diaper in another way. The ICT knowledge was provided by Abena (private partner). The process resources (i.e. the actors who guided the other stakeholders through the project) was delivered by Significant, who was responsible for the change management.

Each of the core partners had their own motives to be involved in the project, listed below:

- Evean: to innovate service delivery but also to achieve cost savings and more efficient processes for the staff (less workload for the nurses and other staff)
- Abena: further testing and developing the product and explore commercial potential of the product
- Significant: mainly involved on a pay basis but also to establish and maintain their reputation in the field

This partnership was organized in the form of a lead organisation (Provan and Kenis 2008), led by Evean, but it still functioned with equal delegation of powers to all members. Decisions were made collectively, and members had roughly the same decision-making power (i.e. formally, the partnership was governed by a lead organization, but in practice, it was more or less a self-governed network; Provan and Kenis 2008). There was a high level of interaction, trust, and consensus between the partners and their goals. This was also possible because the partnership was relatively small and communication lines were short. Evean was thus the lead-organisation who was also responsible for the financial support. The central position of Evean made the coordinator a highly centralised broker in the strongly connected, but small, partnership.

Network management

There were no major conflicts present in the project in terms of different opinions/shortage of specific knowledge or strategic behaviour among partners. However, the participating actors aimed to reveal possible different perspectives and integrate these perspectives into the project to improve its overall quality. This was done through the involvement of users (nurses and patients) who reviewed and tested the Smart Diaper during the pilot process. This user involvement (more later) focused on enhancing the customer/user experiences.

Network complexities were not so much experienced with regard to differences of perceptions or developing the tool, since the aims and time schedule of the project were known and set from the start. If present, the complexities were mainly related to the implementation of the tool, where unforeseen complexities emerged in the coordination of the process. The technical coordination was done by Abena and the guidance of implementation process by Significant. That meant that questions asked by users could not always be addressed by each partner. Furthermore, the shortage of time of the nurses was a problem. In general, involved actors observed that good and intense communication was very important in the implementation process because technical and organisational problems emerged throughout the project. We listed some examples below:

- Technical problems with the diaper (construction did not fit with all patients in the same way and the ICT tool did not always work perfect)
- There was more communication necessary about how to implement the provided care and how the Smart Diaper changed the way patients were cared for and how choices were made (e.g. is it more important to let the patient sleep, or to change the diaper, etc.). Such choices are constantly made during care giving and were directly influenced by the new tool.
- The nurses indicated that they did not always find the diaper very user friendly
- The problems during implementation can also be seen from the relatively high number of patients who stopped using the diapers (because they did not like it, because they did not fit very well or because of other reasons). In general, the observation was that in situations where patients needed more intense care and had more serious physical or psychological preconditions, there was more negative feedback from patients (or from the nurses that were involved with these patients).

Thus, the communication between the caregivers and Abena/Significant was very important. Given the shortage of time, short intensive feedback sessions were mostly chosen to facilitate this communication. There was also room to organise ad hoc meetings, when this was

necessary. Also, other network management strategies were employed by the partners in the project. The partners used exploring strategies to search for goal congruency and to create variation in solutions. This was done in the Petit Committee meeting in the beginning of the project. Moreover, the partnership attempted to share human resources via connecting strategies. This was a selective process of hiring and searching for the right actors who could fulfil and mobilize vital resources that were necessary to realise the project. Furthermore, during the implementation, the three partners tried to have regular feedback moments with the users (nurses) about problems and complications. The partners exchanged staff and (human) resources to share information. The implementation process was also guided by rules and procedures to align time planning/management and to reduce conflict.

Dynamics and activities in the innovation process

Ideas were mainly generated through the interaction between individuals. Abena Nova was the driving power behind the technology of the intelligent diaper. However, the interaction between the various stakeholders (Evean, Philadelphia) caused that the implementation in various nursing homes in 2018/19 was reviewed as a success. Additionally, the actors in the project focused on finding similarities between different views and ideas. This led to personalised continence care.

There was a general agreement between the partners at the start of the process that the project had to lead to a realizable and feasible product. As such, there was a clear commitment amongst the partners at the start of the project to implement the innovation.

Societal support for the innovation

The project was not aimed in the first place to create societal support. Media, politicians, and actors outside the partnership in the broader healthcare sector were not necessary for the success of the project. The Abena technology group and MediSens, were responsible for the accurate, high and stable, quality of IT-consultants and developers in this project. Furthermore, the nursing homes played an active role in this innovation process. There were however several successful attempts to generate (media) attention and improve the image of

the project and the organizing actors. As mentioned, the partnership also attempted to win a price that was organised by the Dutch Ministry of Health, Welfare and Sport in the Netherlands. The implementation of this health innovation in nursing homes in 2018 decreased the number of wet beds by 76% due to the intelligent continence solution of the Smart Diaper. The project partners communicated these results actively towards the Dutch Ministry of Health, Welfare and Sport, and were eventually rewarded with the price 'Career Innovator 2019' in January 2020. Asking support of and sending in the project for the ministry program challenges, also enhanced the pressure with the partners to make the project a success. This innovation also won the 'Nursing homes of the future challenge' as part of the 'Care Innovator 2019' price. Furthermore, the project received international recognition for compassionate care and won the European 'Kate Granger Award for Compassionate Care' in the category 'team and organisation' for its intelligent continence solution[29].

User involvement

Both nurses and patients were involved in the project to advise the partnership about the innovation. However, due to the mental and physical state of the patients (a significant number suffered from various stages of dementia), feedback was mostly provided by the nurses. As we have already mentioned, some patients decided to stop wearing the diaper, which was of course valuable indirect feedback of the patients for the partners.

The nurses were involved during the pilot-testing phase in which user-knowledge and user-experiences were used to enhance the quality of the Smart Diaper/intelligent continence product. After the episodes of user involvement, various peculiarities/product-flaws were discussed by the partners and solved to improve the quality of the final product. An important role of the users was thus to provide advice on the value of the diapers and whether they were helpful for the patients. This also meant that the wireless/connected apps that streamed the 'wetness levels of the continence products' in real time, needed to be accurate so that the

[29] The European 'Kate Granger Award for Compassionate Care' is a prize which recognizes organizations that have delivered care with compassion for the patient. A European panel nominates projects which are eligible for the award. More information can be found on: https://www.himss.eu/european-kate-granger-awards

nurses would benefit from this technology. This user involvement aspect was used to find and explore peculiarities of the diaper, which helped to overcome product-flaws using user-experiences, to build a stable, high quality product.

The user input led to changes in the Smart Diaper, but also to changes in the software for the mobile devices of the nurses. For instance, was the real time information on the wetness levels of the Smart Diaper accurate, stable, and efficiently working? Furthermore, the input of the users also focused on the 'comfort' aspects. In other words, was the Smart Diaper comfortable to wear? Together this information led to changes and improvements to optimize the final product. Although the project was tightly structured and fairly strictly organized, there was room to learn from users and to improve the product. It was attempted to incorporate various new perspectives into the Smart Diaper via user knowledge and experiences.

Success factors

The Smart Diaper was in general successful and is easily connected to care-givers who can install the app on their mobile devices. They then receive/stream the information about 'wetness levels of the continence product' in real time, which makes the nurses more efficient when they need to help the patients. There were several issues however on the practical use of the diapers with patients, which led to a situation that various clients did not want to continue and/or nurses decided that continuation was not feasible.

In general, the collaboration was moderately rigid, and the stakeholders were keen and committed to achieve their goals but were also willing to adapt the technology to practical experience. The Smart Diaper is innovative and in principle helps patients who wear the diaper. It also helps nurses to provide better and faster care, since they are better informed about the patients' needs. We identified the following success factors of this project:

- Support and commitment from the management board
- Nurses could decide themselves if they wanted to join (on a voluntary basis)
- There was room for trial and error during the process
- Proactive role of the change management firm
- Much attention to the nurses that used the diaper

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