SHAPES

Smart and Healthy Ageing through People Engaging in supportive Systems

D3.3 – Scaling-up Improved Integrated Care Service Delivery

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Lead author	Evert-Jan Hoogerwerf (AIAS)
Contributors	Valentina Fiordelmondo (AIAS), Marco Pasin (AIAS), Melanie Labor (NUIM), Ronan O'Sullivan (UCC), Esperança Lladó Pascual (CH), Alexia Zurkuhlen (GEWI), Maureen Spargo (NHSCT).
Peer reviewers	Philip Franke (CSS), Vera Hörmann (AGE)
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Revision History

Table 1 Revision History

Revision #	Date	Editor	Comments
0.1	12/03/2022	Evert-Jan Hoogerwerf	Main author establishing Table of Contents
0.2	30/03/2022	Melanie Labor, Ronan O'Sullivan, Maureen Spargo, Evert-Jan Hoogerwerf	Adding content
0.3	03/04/2022	Evert-Jan Hoogerwerf	Draft for first review
0.4	07.04.2022	Philip Franke & Vera Hörmann	Review
0.5	20/04/2022	Evert-Jan Hoogerwerf	Draft for final review
1.0	25/04/2022	Evert-Jan Hoogerwerf	Final version for submission

Table of Contributors

Table 2 Deliverable Contributors

Section	Author(s)
Table of Contents	Evert-Jan Hoogerwerf (AIAS)
1.Introduction	Evert-Jan Hoogerwerf (AIAS)
2. Summary of D.3.2	Evert-Jan Hoogerwerf (AIAS)
3. Case reports	Evert-Jan Hoogerwerf (AIAS)
4. Method	Evert-Jan Hoogerwerf (AIAS)
4.1. Survey	Ronan O' Sullivan (UCC)
4.2. Consensus building workshop	Evert-Jan Hoogerwerf (AIAS)
4.3. Focus group	Maureen Spargo (NHSCT)
5. Models and tools	Evert-Jan Hoogerwerf (AIAS)
6. Conclusions	Melanie Labor (NUIM)

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Table of Acronyms and Abbreviations

Table 3 Acronyms and Abbreviations

Acronym	Full Term
AHA	Active Healthy Ageing
AMI	Acute Myocardial Infarction
BP	Blood pressure
CONOPS	Concept of operations
COVID-19	Coronavirus Disease 2019
D.	Deliverable
DoA	Description of the Action
EC	European Commission
EU	European Union
GP	General Practitioner
GPS	Global Positioning System
HIS	Health Information System
ICT	Information and Communication Technology
IT	Information Technology
KPI	Key Performance Indicator
M.	Milestone
MAFEIP	Monitoring and Assessment Framework for the European Innovation Partnership on Active and Healthy Ageing
MAST	Model for ASsessment of Telemedicine Applications
NASSS	Nonadoption, abandonment, scale-up, spread, and sustainability
QoL	Quality of Life
SHAPES	Smart & Healthy Ageing through People Engaging in Supportive Systems
ToC	Table of Contents
UK	United Kingdom
WP	Work Package
WHO	World Health Organization

Keywords

Integrated care, Technology adoption, eHealth, Digital Health, Person-centred technology, 4-Wheel Framework

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Executive Summary

The current deliverable (D3.3 Scaling-up Improved Integrated Care Delivery) is the result of the work done as part of Task 3.2 (Scaling-up Improved Integrated Care Service Delivery). Task 3.2 aimed to contribute to a better understanding of the factors that impact on the successful deployment, scaling-up and transfer of integrated care programmes and it has focussed its attention on the role that person-centred technology can play in improving integrated care. As described in the introduction (Chapter One), D3.3 builds on D3.2 (Scaling-up Improved Integrated Care Delivery V.1). D3.3 reports on further investigations into the relationship between person-centred technological solutions and their role in the delivery of integrated care. Combining the work done in both deliverables, D3.3 offers a comprehensive set of recommendations for the implementation, adoption and scale-up of the SHAPES Platform and digital solutions across Europe. The knowledge base produced in both deliverables will be useful to a wide range of parties interested in integrated in managing and improving integrated care, such as developers, producers, service providers and service users.

Chapter One describes the goals, rationale and purpose of the deliverable.

Chapter Two summarises the work done in the previous deliverable (D3.2) on which D3.3 builds.

Chapter Three provides an overview of the additional work that was done in this second iteration of the previous report (D3.2). It summarises four additional case studies collected to fill the gaps left in D3.2. A more detailed overview of these additional case reports can be found in Annex 1. It also lists additional factors, which impact on the successful adoption of technology in health and social care delivery. These factors, which were not previously identified in D3.2, emerged following an analysis of the new case studies.

Chapter Four outlines in detail the various further activities implemented in T3.2., namely a survey administered to rank the factors (identified in D3.2) which should be considered before adopting technology based solutions in care programmes, in terms of importance, and the work done to further prioritise among the critical factors, to better describe their impact on integrated care and to identify the conditions that need to be in place within a care system so that these factors will lead to a successful outcome.

In Chapter Five the findings from the present research are reported. Section 5.1 describes the factors that should be considered when implementing technology-based solutions to mediate the integration of health and social care delivery, its management or improvement. Section 5.2 introduces a self-assessment tool which managers and developers can use to keep track of the extent to which they have considered the factors listed in the previous section. Section 5.3 describes the final and improved version of the 4 Wheel Framework introduced in D3.2.

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Chapter Six provides a summary of this deliverable and evaluates the strengths and limitations of the results of the work. Finally, it offers a list of detailed recommendations for the upscaling and transfer of the SHAPES platform and digital devices.

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1 Introduction

Health and care systems require reforms and innovative solutions to become more resilient, accessible, and effective in providing quality care to European citizens. Due to the ageing population, economic pressures, and more recently to the experience with global pandemic crisis, the need to improve and adapt the health and care system to new contexts, operational needs and contingent situations has significantly increased.

Both, the development of people-centred integrated care programmes (WHO, 2015) and the use of new technologies (WHO, 2020 & European Commission, 2018 & Deloitte, 2015), are identified by the global community as key strategies to cope with the seriousness of the challenges faced by health and care systems to meet current and future demands for quality care in a flexible and economically sustainable way.

The design of digital solutions and their development is a complex, though relatively easy challenge when it takes place in controlled environments such as research labs or in the framework of research projects. More challenging is making the solutions work for people and for organisations, each of which has different needs, expectations, preferences, and workflows. Also, contextual factors must be considered, such as the wider care ecosystem, health and care systems' functioning, policies and regulations, and economics.

Task 3.2. aims to contribute to a better understanding of the factors that impact on the successful deployment, scaling-up and transfer of integrated care programmes across various socio-cultural and economic contexts. Seen the nature of the SHAPES project the focus in this task is on the role that person-centred technology plays in fostering integrated care. This is relevant for the SHAPES project whose platform and solutions will have to work in real life contexts with the perspective of being included in programmes and to impact on the way care is provided.

This deliverable reports on the work undertaken under Task 3.2. of the SHAPES project following the submission of Deliverable 3.2. It builds further on the outcomes of the work reported in D3.2. completing information and adding original work implemented with the involvement of WP6 members as primary informants.

D3.2. holds a report of desk research aimed at understanding different aspects of integrated care, including its values, models, trends, and evidence. The findings form an elaborate stand-alone chapter that has guided the team in the steps undertaking between M15 and M30, but that is not further updated.

D3.2. further contained the collection and analysis of case reports of experiences with technology adoption in integrated care programmes across Europe. This piece of work has been taken further and four more case studies have been included in the data collection.

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D3.2. also reported on factors identified that impact on the adoption of person-centred technology-based solutions in integrated care. A long list of factors was identified and clustered into a model, the so called 4-Wheel Framework Model. Also, that work was taken further between M16 and M28, informed by the additional cases that were analysed, as well as by an extensive interaction with WP6 team members and experts that have helped the team to "weight" the factors and to identify the core factors that need to be considered in deploying solutions. In this deliverable we will report on that process and its outcomes.

1.1 Rationale and purpose of the deliverable

The rational and purpose of the deliverable is to report on the final steps in a long process undertaken by the T3.2. team to identify the relationship between person-centred technology-based solutions and integrated care. In particular, the focus has been on the factors that facilitate or constitute barriers for the development of integrated care. The final goal of this task is to contribute to the development of key recommendations for the implementation, adoption and scale-up of the SHAPES Platform and digital solutions across Europe (D3.10 - SHAPES Change Management and Implementation Handbook and D3.11- SHAPES Recommendations), and to make that knowledge base available to the wider community of stakeholder in integrated care, such as developers, producers, service providers and end users.

1.2 Key inputs and outputs

Key inputs to this deliverable are:

- Work done under this Task before M15 and reported in D3.2., including a draft model and lists of impacting factors on technology adoption in integrated care;
- The analysis of additional case reports of existing technology adoption in integrated care programmes (See Annex 1);
- The result of work with key informants from WP6.

Key outputs of this deliverable are:

- A finetuned model supporting technology adoption, upscaling and transfer in integrated care pathways.
- A self-assessment checklist for developers of solutions and for those adopting solutions.
- Recommendations for the upscaling and transfer of the SHAPES platform and solutions.

1.3 A note on terminology

Throughout the deliverable the terms "Person-centred technology" or "Person-centred solutions" are frequently used. "Person-centred" in this context refers to technology that is

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deployed for the benefit of older adults that have consented in the active or passive acquisition of personal data regarding their condition with technological means and have consented in the sharing of those data with others that with different roles are part of their care ecosystem. “Technology” is used to specifically refer to the assistive hard and software (e.g., devices, platforms, apps, etc.) that is used, while “Solution” is used to refer to assistive technology + human intervention + interventions on the environment, if needed (Andrich et al., 2013).

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2 Summary of D3.2 – Scaling-up Improved Integrated Care Service Delivery V1

Deliverable 3.2. was submitted in the early stage in the implementation of Task 3.2. which aims to contribute to a better understanding of the factors that impact on the successful deployment, scaling-up and transfer of integrated care programmes and more in particular on the role of technology adoption in that process. This is relevant for the SHAPES project whose platform and solutions will have to work in real life contexts with the perspective of being included in programmes and to impact on the way care is provided. The deliverable has reported on the two main activities that have been undertaken by the task implementing team before M15.

Deliverable 3.2. follows the research conducted in Task 3.1 where the organisational structures, systems and processes of the health and care services in different European Countries were identified and analysed. This was directly informed by the felt need to design the building blocks for strategies and tools that support the scaling-up of improved integrated care service delivery. We have explored and analysed models of integrated care and identified and described the challenges related to its advancement. The first activity was desk research aimed at understanding different aspects of integrated care, including its values, models, trends, and evidence. The findings were reported in Chapter 2 (D3.2). The outcomes show that although there is a rather good understanding of the values at the basis of integrated care, the way to get there is windy and complex. There are different models of integrated care embedded in different health and care systems and evidence is not always so clear. Nevertheless, a clear trend is the increasing attention for digital technologies that can facilitate or even enable sustainable integrated care.

We have further identified, and analysed technology enabled person-centred integrated care initiatives supporting and extending healthy ageing and independent living of older individuals across Europe, with the aim to learn from them. The perspective of public and private service providers has been taken as a starting point for this analysis.

The second activity thus involved the collection of case reports of experiences with technology adoption in integrated care programmes (some experimental) across Europe. Based on interviews with managers of the programmes, an initial thirteen experiences were described and analysed, leading to an overview of factors to consider when deploying or upscaling person-centred technology-based solutions in integrated care. The factors have been clustered in different domains and stages in the technology adoption process in integrated care programmes (Table 4).

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Table 4 Relationship between domains and stages in technology uptake for improved integrated care

Stage	Domains of impacting factors
Conceptualisation *In this "imaginary" stage a possible solution to existing needs is imagined and theorised.*	Target groups and needs
	Policy and regulations
	Values, vision, and goals
Contextualisation *In this "feasibility" stage a possible solution is assessed according to its compatibility with existing local health and care systems, cultures and practices and its financial sustainability.*	Health system
	Care pathways and service flow (re)design
	Economic
Development and implementation *In this "realisation" stage a feasible solution is made into reality and technology is embedded in a service flow.*	Human
	Technology
	Solution design
	Information and communication
	Implementation process management
Evaluation and consolidation *In this "evaluative" stage the solution outcomes are measured, and plans are made for adaptation, scaling-up or transfer of the solution and its results.*	Outcomes Impact

The result was a draft model, the 4-Wheel Framework model for technology adoption in integrated care presented in Chapter 3, while the case reports were included in the Annexes to D3.2.

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3 Case reports

3.1 Additional case reports

Between M20 and M27 relevant information about four additional cases of deployment of digital person-centred solutions in integrated care programmes or systems was collected.

The criteria used for selecting the cases were previously established:

- Patient/user centred solutions

(e.g., technology is deployed for the benefit of older adults that have consented in the acquisition of personal data regarding their condition with technological means and have consented in the sharing of those data with different professionals and informal caregivers that with different roles are involved in their care ecosystem).

- Part of operational service delivery models

(e.g., solutions are regularly, frequently or permanently used since at least one year and are meaningfully part of a wider health and/or social care service delivery model involving also human intervention, with a clear lead organisation responsible for the deployment of the solution.)

- Connecting different actors in a care ecosystem.

(e.g., solutions collect data that are distributed to different stakeholders in a care ecosystem that are aware of each other, and that have the possibility to contact each other).

- Non-exclusively focussed on short term medical treatment.

(e.g., solutions are explicitly deployed over a longer period for preferably more than one purpose in the health and social domain, for example prevention, stimulation, treatment, monitoring, self-management, therapy adherence, quality of life, social connectedness, communication)

Evaluated from the perspective of different stakeholders

(e.g., the provider or commissioner of the solution has collected feedback from multiple stakeholders about the effectiveness of the solution).

It proved hard to find many experiences fully meeting these criteria, which is why in the end also some experimental projects were included and analysed.

The method of finding these cases, as well as the data collection guidelines and the method of analysis have been extensively described in D3.2. The four new cases are relevant as they cover additional countries and types of technology. The four new case reports are included as an annex (Annex 1) to this deliverable, together with the full list of cases, while Table 5 shows the additional cases only.

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Table 5 List of additional case reports collected and analysed

Case n°	Name	Country	Technology	Status
Additional case reports				
Case 14	E.Ca.R.E. (Elderly home Care Residential Engagement)	Italy	Tablet with a platform integrating data from smart home and health monitoring sensors. Communication software, Games.	Technology developed and tested
Case 15	LivingLab - Dementia	Italy	Tablets equipped with apps for cognitive stimulation, voice assistants (Alexa), smartphones, GPS trackers and smartwatches	Technology developed and tested
Case 16	Telemonitoring of patients with advanced heart failure	Czech Republic	A telemonitoring system with monitoring devices	Technology implemented
Case 17	Tele-monitoring of patients with Acute Myocardial Infarction (AMI) and newly diagnosed diabetes	Czech Republic	A telemonitoring system with monitoring devices	Technology implemented

3.2 Additional impacting factors identified

Impacting factors in this context are factors that may determine success or failure of a technology adoption process depending on their importance and the extent to which they are addressed. In a certain way they can be considered “Risk-factors” that need to be “under control”.

The following impacting factors that were not yet identified in the previous case reports described in D3.2 have been identified in the additional case studies:

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Table 6 List of additional impacting factors identified with reference to the case report [n.]

Stage	Domains	Additional impacting factors
Conceptualisation	Target groups and needs	The previous experience of the organisation with technology adoption in person-centred care. [14]
	Policy and regulations	The existence of (international) models of reference in a specific area of intervention [16, 17]
	Values, vision, and goals	
Contextualisation	Health system	The impact on the number of additional staff needed to support the use of technology [15] The compatibility with existing protocols and health interventions [16, 17] The potential to improve treatment and care protocols and guidelines [16, 17]
	Care pathways and service flow (re)design	The involvement of wider formal and informal care networks and caring communities. [14] Understanding of the stakeholders involved and how they collaborate [15]
	Economic	
Development and implementation	Human	The level of training provided to all stakeholders. [14] The presence of positive role models. [14]
	Technology	The rapid development in technology that impacts on the life cycle of devices and system configurations. [14]
	Solution design	The experience of the organisation with technology adoption. [14]
	Information and communication	The integration of solutions allowing for interpersonal communication. [14]
	Implementation process management	Sufficient time should be available for the personalisation of devices and wider solutions. [14]
Evaluation	Outcomes	
	Impact	

The additional impacting factors have been included in the list of impacting factors as represented in D3.2. During the review of the final list as presented in Annex 3, they might have been slightly reformulated, based on the work described section 4 and 5 of this deliverable, nevertheless keeping the concept intact.

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4 Ranking and refining impacting factors

With the scope to improve and validate the 4-Wheel Framework model for the adoption, upscaling and transfer of person-centred technology in integrated care, to provide tools for its use, and recommendations, the following process was implemented:

Step 1: With the aim to identify the relative importance of each impacting factors and the collection of additional ones, a survey tool was designed and delivered to the community of developers, researchers and service providers involved in the SHAPES pilots. The scope of this exercise was to raise awareness among this expert community about the knowledge accumulated so far under T3.2. regarding technology adoption in integrated care and to review it based on the experience and expertise accumulated so far in WP6.

Step 2: With the aim to further narrow down the selection of most impacting factors a consensus building workshop was organised. This exercise was undertaken to identify core factors for the success of technology adoption in integrated care.

Step 3: With the aim to better describe the relationship between those core factors and integrated care, as well as to define recommendations for those adopting technology based person-centred solutions in integrated care, a focus group was organised.

As informants to this data collection, key people involved in WP6 were identified, in particular:

- The pilot site leaders
- The use case leaders
- The technology or solution providers
- Service providers involved in the piloting.

Their participation to this process was considered relevant for the consortium as a whole and for the success of the project, as under WP6 the platform and the digital solutions developed under the pilot themes and use scenarios are being tested: in terms of technology uptake an important preparatory phase for small- or large-scale adoption in “real life” settings, for understanding market potential and to improve design features.

It was presumed that there was expertise in the group of informants regarding factors that are expected to impact on the deployment of the technology in established service delivering contexts (beyond the pilot phase), and probably on its possible upscaling and transfer to other geographical contexts and care systems.

A preparatory e-mail was sent to the general WP6 list on December 13th, 2021, and, following a recognition of the key stakeholders involved, an invitation letter with a guidance document regarding the process was e-mailed on January 3rd, 2022, to the 46 identified experts involved in the technology development and pilots.

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Of these, 19 responded to the survey of step 1, 15 took part in the consensus building workshop (February 9th, 2022) and 16 in the focus group (February 22nd, 2022). Both events were held online using the Zoom conference facility platform.

The participants taking part in the consensus building workshop and the focus group were to a large extent the same people.

4.1 The survey

4.1.1 Survey tool

The tool used for Step 1, the Survey, was set up using Google Forms. For each impacting factor listed in the survey the participants were asked to rate on a 0–5 interval scale from "not at all important" to "very critical". Also "unsure" was added as an option. Finally, respondents were asked to identify missing factors.

It was explained that participation was anonymous and that only aggregate data would be reported respecting the anonymity of the individual respondents.

Survey into the importance of impacting factors on person-centred technology adoption in integrated care

Dear respondent,

Task 3.2 of the SHAPES project is investigating factors that impact on the successful adoption, upscaling and transfer of person-centred technologies supporting health and social, and ideally integrated, care services (further: digital solutions).

To limit the field, we are considering situations where digital solutions are deployed for the benefit of older adults that have consented in the acquisition of personal data regarding their condition with technological means and have consented in the sharing of those data with different professionals and/or informal caregivers that with different roles are involved in their care ecosystem.

A long-list of factors that may impact upon the expected success or failure of the adoption of a new digital solution by a service provider has been compiled by analysing the experiences of other organisations across Europe that have adopted person-centred digital solutions into their integrated care services (SHAPES T3.2.). An impacting factor can determine the success or failure of a process, depending on if and how its positive or negative effect is addressed. To help the understanding and interpretation of the factors they have been grouped thematically based on the stages of the 4 wheel framework for technology adoption in integrated care developed earlier in Task 3.2.:
-Conceptualisation

Figure 1 Screenshot of the survey tool's introduction page

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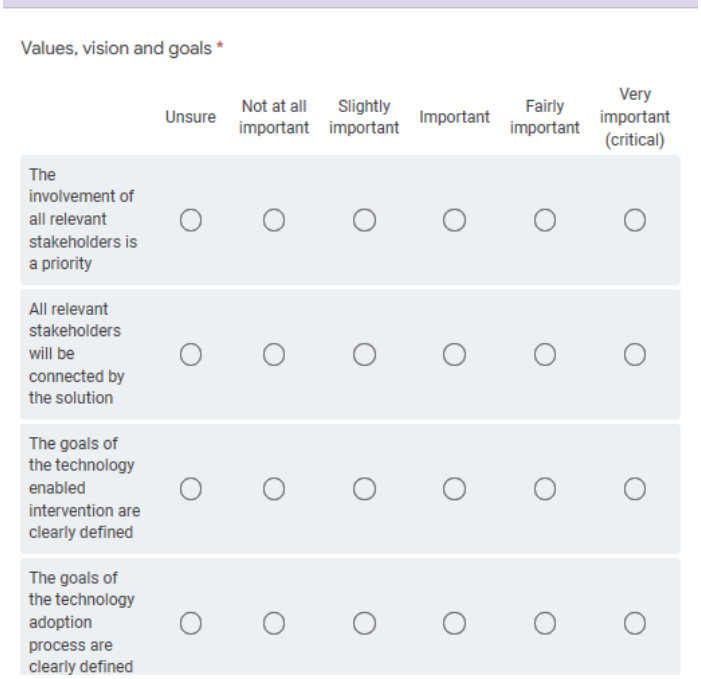

Values, vision and goals *

	Unsure	Not at all important	Slightly important	Important	Fairly important	Very important (critical)
The involvement of all relevant stakeholders is a priority	○	○	○	○	○	○
All relevant stakeholders will be connected by the solution	○	○	○	○	○	○
The goals of the technology enabled intervention are clearly defined	○	○	○	○	○	○
The goals of the technology adoption process are clearly defined	○	○	○	○	○	○

Figure 2: Screenshot of one of the rating pages of the survey.

It was further highlighted that the survey was not investigating the impact of these factors on a specific SHAPES use case, digital solution or platform, and that data collected from respondents would not be analysed in such detail that useful information for the single SHAPES use cases could be retrieved. The respondents were asked to apply their knowledge and experience regarding any person-centred digital technology adoption in traditional care delivery models.

The expected result of the survey was to have a rating for each factor allowing to compare the impact of each factor on the success of the technology adoption process.

4.1.2 The Survey outcomes

The 19 survey respondents ranked a total of 158 impacting factors listed in the survey on a 0–5 interval scale from “not at all important” to “very critical”. To identify consensus among the respondents as to the factors they felt were most important, each factor was graded based on the percentage of respondents that selected each item on the interval scale. Each interval was then given a value with *not at all important* being a value of 0 and *very important* being a value of 5. *Unsure* was also assigned a value of 0. The final calculation was to multiply each intervals consensus percentage by the assigned value which gave each impacting factor, an overall score as to how important it was to the cohort of respondents. In the following example taken directly from the data, 5 respondents out of 19 (26%) rated the impacting factor *“The beneficiary group is well defined”* as being *“Fairly important”* and the remaining 14 respondents rated it as being *“Very Important (Critical)”*. This provided a total score of 374 *[(26x3) + (74x4)]* for this impacting factor which was then used to rank its importance against the other factors.

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Table 7 Example of survey ranking calculations

Impacting Factor	~	Not at all Important 0	Slightly Important 1	Important 2	Fairly Important 3	Very Important (Critical) 4	Total Score
The beneficiary group is well defined	n	0	0	0	5	14	374
	%	0	0	0	26%	74%	
	value	0	0	0	78	296	

The following tables reflect the top 3 ranking of each of the factors according to their categorisation.

Table 8 Highest rated Conceptualisation factors

DOMAIN	FACTOR	Score
Needs and target groups	The beneficiary group is well defined	374
Needs and target groups	The needs and interests of the beneficiary group are well defined across the care domains (health, social, education, etc.)	357
Values, vision, and goals	The concept solution is person-centred	352

Table 9 Highest rated Contextualisation factors

DOMAIN	FACTOR	Score
Care pathway and service flow (re)design	The technology embedding service flow meets the expectations and needs of the beneficiaries	342
Care pathway and service flow (re)design	The concept solution has been discussed with all stakeholders	331
Health System	The solution is considered desirable by all stakeholders	326

Table 10 Highest Rated Implementation factors

DOMAIN	FACTOR	Score
Solution Design	The solution design is functional from the end-user perspective	379
Technology	Technologies are safe and secure	374

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DOMAIN	FACTOR	Score
Technology	Interfaces are intuitive and easy to use	369

Table 11 Highest Rated Evaluation and Consolidation factors

DOMAIN	FACTOR	Score
Outcomes	Data about patient satisfaction can be collected	330
Outcomes	Patient data regarding adherence to treatment/medication can be collected	322
Impact	A positive impact on healthier lifestyle development can be expected	316

The following table identifies the highest rated factors overall as ranked by the 19 respondents.

Table 12 Overall Highest Rated Impacting Factors

DOMAIN	FACTOR	Score
Solution Design	The solution design is functional from the end-user perspective	379
Needs and target groups	The beneficiary group is well defined	374
Technology	Technologies are safe and secure	374
Technology	Interfaces are intuitive and easy to use	369
Needs and target groups	The needs and interests of the beneficiary group are well defined across the care domains (health, social, education, etc.)	357

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Finally, the 13 domains were ranked by the level of consensus among respondent for the factors in each domain. It should be noted that the separation between each rank was very minor, meaning that all factors were probably considered important to very important.

Table 13 Ranking of Domains by Consensus Importance

IMPORTANCE RANKING	DOMAIN
1st	Needs and Target Groups
2nd	Health System
3rd	Implementation Management
4th	Outcomes
5th	Values Vision and Goals
6th	Human Factors
7th	Solution Design
8th	Technology
9th	Communication
10th	Impact
11th	Policy
12th	Care Pathway and Service Flow
13th	Economic Sustainability

The survey further asked through two open questions the participants to comment on impacting factors considered particularly relevant for upscaling and transfer of technology supporting integrated care services. The following lists were obtained (literally reproduced):

Upscaling

- Broad applicability, simple to use solutions that generate efficiencies (cost, resource etc.).
- Regulatory framework and policies in various countries that could hinder the upscale of the solution.
- The user engagement with the technology because they are aware of the need to self-manage their condition, or because the doctor recommended the use of the technology, or because they believe it will reduce their workload
- Factors related to the impact and scalability of the solution.
- Economic efficiency and international policy.
- Flexibility of the solution, willingness to pay among stakeholders, financial sustainability, efficiency, communication.
- Evidence-based increase in efficiency of health and care service delivery and improvement of target group's health and wellbeing.

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Transfer

- Easily adaptable.
- Specifics of the existing health and care system (free medication vs. paid medication scheme; insurance schemes) and cultural aspects (for example, on diet or nutrition).
- Factors relating to standardisation and privacy policies.
- To consider specific needs of beneficiaries in other regions and to control for external factors.
- Adaptability, standards adherence, open climates, data protection.
- Identification of champions / good communication of results.

The representation of these factors in the already existing list of factors was cross checked. They have helped to inform the final shape of the list.

4.2 Consensus building workshop

The aim of the consensus building workshop was to further prioritise among the critical factors bringing them down to one most critical core factor per domain. The methodology applied was that of a consensus building workshop, during which the participants in smaller groups discussed the three or four factors for each domain that were indicated through the survey as the most critical for that specific domain. As a guideline for the discussion the groups were asked to identify possible indicators for the measuring of each factor and issues regarding its interpretation. The scope of these instructions was to make the participant think deeper about the factor and its actual meaning and whether there was consensus on its interpretation. It was expected that during the discussions a more homogeneous interpretation of the factors would emerge. Notes were taken by the group.

During a final plenary session, the participants were invited to express a vote for the most critical factor in each domain, with the aim to hand these over to the focus group for further analysis.

During the consensus building workshop the following 13 factors were discussed:

CONCEPTUALISATION

- The beneficiary group is well defined
- The needs and interests of the beneficiary group are well defined across the care domains (health, social, education, etc.)
- The concept solution is person-centred

CONTEXTUALISATION

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- The concept solution has been discussed with all stakeholders and is considered desirable by all stakeholders
- The technology embedding service flow meets the expectations and needs of the beneficiaries
- The solution implementation will lead to an increase in the efficiency of care delivery

IMPLEMENTATION

- The solution design is functional from the end-user perspective
- Technologies are safe and secure
- Interfaces are intuitive and easy to use

IMPACT EVALUATION

- Data about patient satisfaction can be collected
- A positive impact on healthier lifestyle development can be expected
- Continuity in care (COVID pandemic) can be better guaranteed
- Patient data regarding adherence to treatment/medication can be collected

The following considerations and issues were retrieved during the discussions:

The beneficiary group is well defined

- Most of the time there is more than one beneficiary group (e.g., not only end users, but also professionals, care managers, governments, etc.).
- These groups should be well defined in terms of eligibility criteria such as age, conditions, digital literacy, or access to technology, etc.
- Too strict inclusion criteria and their interaction might lead to small populations.
- All potential beneficiaries should be able to self-identify themselves in the expected benefits.
- To assess this factor a significant number of beneficiaries should have been involved.
- Connectivity remains an important prerequisite.

The needs and interests of the beneficiary group are well defined across the care domains (health, social, education, etc.)

- Even in homogeneous groups the needs and interest will be very personal.
- It is important to ask people about what is important to them and to be able to provide personalised approaches.
- Healthcare professionals have needs as well.

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The concept solution is person-centred

- Person-centredness lead to more inclusion.
- It involves participation and access to information and ownership of data
- Is the solution developed with end users and respond to their needs?
- Caregivers or loved ones should be involved to help make choices.

The concept solution has been discussed with all stakeholders and is considered desirable by all stakeholders

- It is important to identify key gatekeepers and wider policy making groups, the patient's care circle, family members, health authorities. Identifying key people is vital.
- It is not easy to have full consensus of all stakeholders as they might have different interests.
- Consider the different profiles of stakeholders and make sure alignment of interest (economic, public benefit, R&D, etc.).
- Consider formalising an agreement between the parties.
- Maybe there are lessons to be learned from comparable solutions.

The technology embedding service flow meets the expectations and needs of the beneficiaries

- The factor formulated as it is might not be clear to all.
- It is a complex factor to address in the contextualisation phase. It relates to the user satisfaction with the current situation and how the technology adoption might impact on this satisfaction.
- The evaluation of expectations and needs is difficult and very subjective.

The solution implementation will lead to an increase in the efficiency of care delivery

- Efficiency can involve different aspects and be measured accordingly.
- Efficiency means saving time and money. The more it will do so the easier it will be accepted and commissioned.
- Efficiency gain can be a win-win situation for all.
- Efficiency gain in real life is nevertheless hard to predict. It will need to be tested.

The solution design is functional from the end-user perspective

- This factor can be assessed both by the end user after having used the system or by a neutral reviewer/observer.
- Only users that actually use the solution can evaluate the design functionality.
- Non-use or abandonment does not necessarily mean that the solution design is not functional. There might be other factors.
- Education and training in the use of the solution will impact on this factor.

Technologies are safe and secure

- Data security is a critical liability.
- Continuous monitoring of these aspects is important.

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- Transparency is important as people nowadays are aware of cybersecurity challenges and issues and might be mistrustful. Certification can help.
- Unpredictable incidents can happen and undermine the trust and confidence of the user.

Interfaces are intuitive and easy to use

- This feature will be different for each user, based on experience, digital literacy.
- Good usability impacts on confidence in use.
- It is difficult to measure as end users might be very optimistic in replying.
- The perspective of professional users is equally important to consider.
- The solution being accessible for all is equally important. There should be no barriers to use it, digital accessibility, universal design are very important concepts, not only for the end user but also for other that allow for interaction to take place in a smooth way.

Data about patient satisfaction can be collected

- Important, but users tend to give socially desirable answers and be too optimistic. Others simply aren't interested in collaborating.
- The data collected based on actual use of the solution might give an indication but cannot substitute direct questioning.
- Different direct or indirect techniques could be used to collect patient satisfaction.

A positive impact on healthier lifestyle development can be expected

- This will be very subjective and be different for each person.
- This factor invites to reflect on the long-term impact of solutions, not only in terms of personal benefits but also societal benefits.
- The importance of not only curing but also preventing.
- Self-management still requires the intervention of health-professionals.

Continuity in care (COVID pandemic) can be better guaranteed

- Does the solution allow for delivering care in different moments and in different places?
- Does the solution lead to make collaboration between actors in the care ecosystem?
- Increasing the amount of data retrieved does not necessarily lead to better health outcomes.
- Continuity in care cannot only be realised through technology. Human intervention should increase as well.

Patient data regarding adherence to treatment/medication can be collected

- There is an issue related to the reliability of the data coming from the patient.
- Clinical supervision remains important.

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Back in the plenary the 13 factors were voted upon, with the aim to identify the most relevant factor for each domain with the following result:

- The needs and interests of the beneficiary group are well defined across the care domains (health, social, education, etc.)
- The solution implementation will lead to an increase in the efficiency of care delivery
- The solution design is functional from the end-user perspective
- A positive impact on healthier lifestyle development can be expected

Based on the discussions and a further analysis in the task team the 4 factors were rephrased as such:

- The solution should match the needs and interests of the beneficiary group across all care domains
- The solution should increase the efficiency in care.
- The solution design should be functional from the perspective of the end-user.
- The solution should foster healthier lifestyles.

These statements were subject to more in-depth analysis during a follow up focus group (See 4.3).

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4.3 Focus group

4.3.1 Focus group methodology

The online collaboration platform 'Mural' was used to facilitate the focus group and collect data from participants. Mural provides a digital canvas for creating and grouping together thoughts and ideas relating to a particular topic or project. The focus group was asked to consider two questions regarding the most critical factors selected during the consensus building workshop.

1. How do the selected factors support integrated care?
2. What conditions need to be met within a system in order for the selected factors to succeed?

Participants were provided with a link to the Mural platform where they were presented with an online whiteboard. Firstly, the question 'How do the selected factors support integrated care?' and the selected factors under scrutiny were detailed at the top of the whiteboard and participants were told how to create sticky notes to record and add their comments to the board. The group were given around 20 minutes to make contributions to the board. Taking each factor in turn, one member of the focus group leaders then led a discussion on each factor, reading out each comment and asking for further explanation or clarification from the contributor where necessary. The completed Mural whiteboard is provided below (Figure 3), while the transcription of the notes can be found in Annex 2.

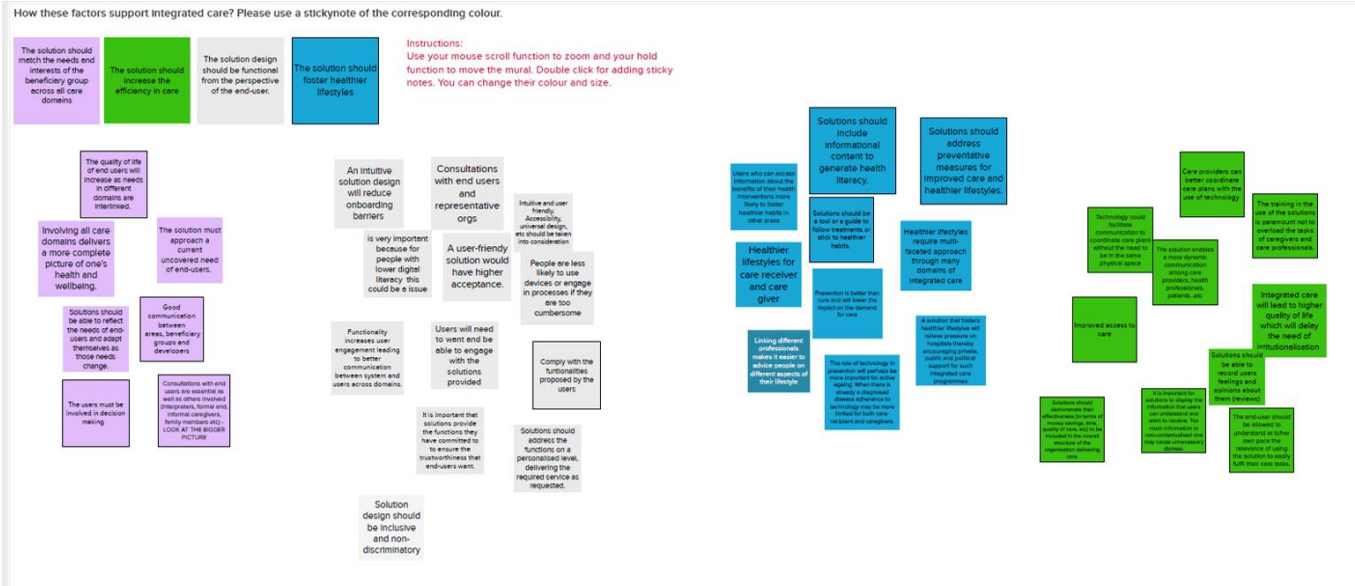

Figure 3 Picture of the mural produced by the focus group participants on the impact of the factor on integrated care

The focus was then directed towards the second question, 'What conditions need to be met within a system in order for the selected factors to succeed?' For this exercise,

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participant were asked to place their comments on one of four images of a target — each detailing one of the selected factors. Placing a comment closer to the centre of the target conveyed how important the participant considered it to be. Participants were provided with 20 minutes to consider their responses and record their comments. The focus group leaders then read each comment in turn — asking for further explanation or clarification where necessary. The completed Mural whiteboard is provided below (Figure 4), while the transcription of the notes can be found in Annex 2.

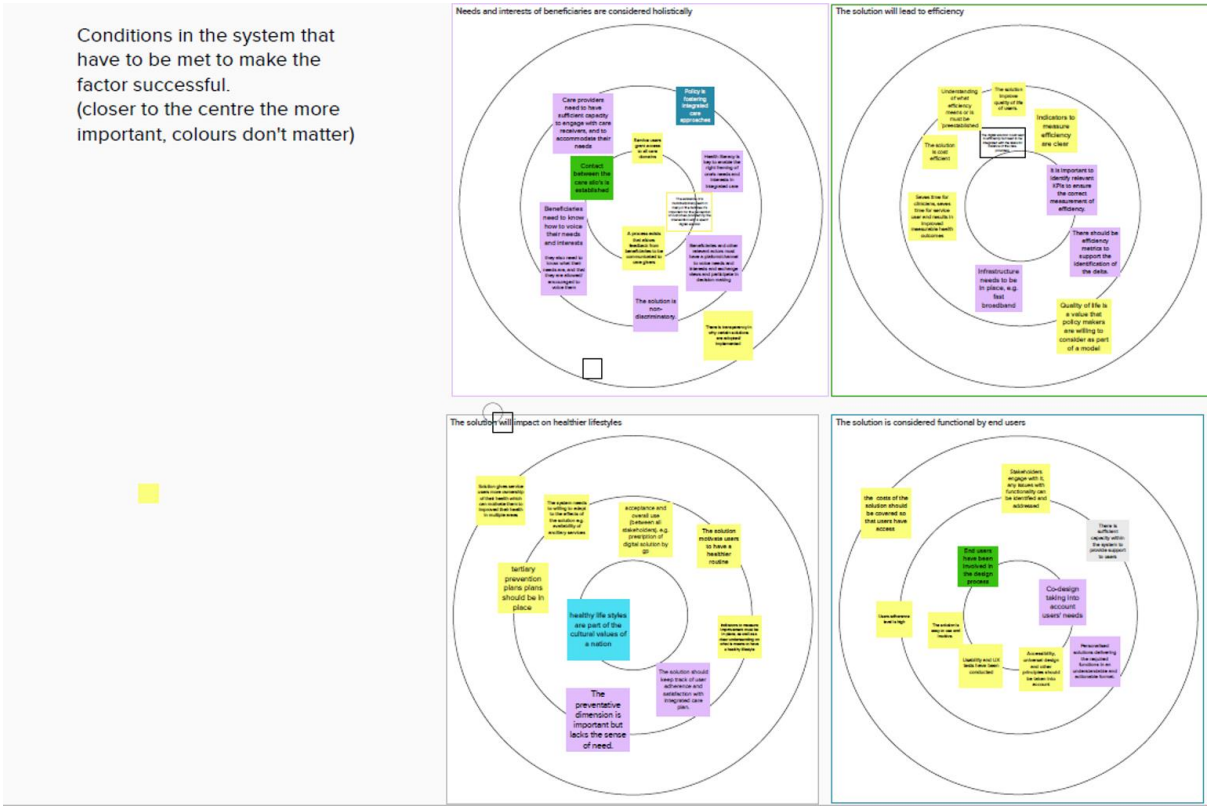

Figure 4 Picture of the mural produced by the focus group participants on the conditions for successful impact

4.3.2 Focus group outcomes

Comments collected from participants during the focus group were discussed amongst the task 3.2. implementation team and then analysed, summarised and reviewed. Summaries of how each selected critical factor relates to integrated care and recommendations for maximising the success of achieving each factor are detailed below, together with the coded comments from the focus group. For the sake of space only the summary and the recommendations related to each factor discussed are represented here. The detailed comments are listed in Annex 2.

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Conceptualisation core factor: The solution should match the needs and interests of the beneficiary group across all care domains

Summary

Person-Centred Technology-based Solutions address needs in interlinked care domains

Integrated care is based on the principle that people experience care needs in different domains and that the quality of life can be enhanced by addressing those needs in an integrated way [1.1]. Technology-based person-centred solutions can address needs and expectations in different interlinked domains in a unique, coherent and integrated manner and facilitate communication among those involved in the care ecosystem [1.5]. Developers of such solutions should therefore have a good understanding of the needs [1.5]. Such solutions will allow end users or patients to be fully involved in decision-making regarding their care plan [1.6], together with their care ecosystem professionals, informal care workers and other support workers [1.7], which will lead to having a more complete picture of one's health and wellbeing [1.2]. Technology-based solution might uncover additional needs of end-users [1.3] and should therefore be able to adapt to changing needs [1.4].

Recommendations

- For technology to support integrated care capacity should be available to engage with end users to retrieve their needs and to monitor how these change over time [5.1].
- Interagency collaboration should be fostered, based on coordination among organisations and sectors [5.2] and stooled on explicit policies to support integrated care in a context ready for the uptake of digital solutions. [5.4].
- Solutions should be based on the full acceptance of the user that will have to grant access to its data collected in different domains [5.3].
- Policy that supports an integrated approach to care should be in place.
- Health and social needs literacy should be fostered across all care domains in order to better understand these needs and how these are interrelated [5.5].
- Multidisciplinary approaches should be sought, to conduct analysis, interpret outcomes and assess the impact of the solution [5.6].
- Beneficiaries should (be supported to) understand their needs and interests and encouraged to voice them [5.9]. Therefore, a process should exist that allows them to communicate these to care givers [5.7 & 5.8].
- A solution should include a platform where beneficiaries and other stakeholders can voice needs and interests, exchange views and be fully involved in decision making [5.10]. Non-discrimination and transparency should be considered core values [5.11 & 5.12].

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Contextualisation core factor: The solution design should be functional from the perspective of the end-user

Summary

End-User-Led Functional Solution Design

Solution design plays a critical role in the success of integrated care programs. Early consultations with stakeholders [2.2] are key and should result in an intuitive, user-friendly, inclusive, and easily accessible [2.3, 2.6, 2.12] program with high acceptance rates [2.1, 2.4, 2.5] among all end user cohorts. It is also important that the solution design complies with the functionalities proposed by end-users [2.9] to ensure the program is viewed as trustworthy and person-centred [2.10, 2.11]. Adhering to these points should ensure a high user engagement level that ultimately leads to better communication between the program and its users who will want to engage more with a system that matches their personalized needs [2.7, 2.8].

Recommendations

- Access to integrated care technology platforms should be free for end users [8.1]
- Users should have the ability to provide feedback on all aspects of functionality to allow any issues to be addressed quickly [8.2]
- An assessment of resource levels within the health system should be completed to ensure there is sufficient capacity to meet the demand created by the integrated care program [8.3]
- A co-design methodology should be implemented to ensure user needs are accurately met [8.4, 8.5, 8.6]
- User experience and usability tests should be conducted to ensure the solution is easy to use, intuitive [8.7, 8.8], and accessible [8.9]
- Solutions should be developed using a person-centered approach [8.10]

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Implementation core factor: The solution should promote healthier lifestyles

Summary

The solution should promote healthier lifestyles

An integrated care system that focuses on the needs of the recipient of care should enable people to engage with their own health; not only in the treatment of diagnosed conditions but also in the pursuit of healthier lifestyles and the prevention of disease. Healthier lifestyles require a multi-faceted approach through many domains of integrated care [3.6] and in connecting different professionals, care providers are better equipped to advice people on all aspects of their health [3.8].

Implementation of the right digital solutions could directly address the prevention of specific diseases [3.3, 3.7, 3.9, 3.10] and/or indirectly encourage healthier living. For example, technologies that incorporate educational material that improves health literacy [3.1] or that provide citizens with better access to their own health data [3.2, 7.1], should encourage them to take ownership of their health and thus motivate them to lead healthier lifestyles [7.4]. People who are healthier rely less on acute care services, which relieves pressure on the overall care system. The adoption of solutions that therefore foster healthier lifestyles are more likely to gain private, public and political support for the integrated care model [3.10].

Recommendations

- The integrated care system should be willing and ready to adapt service provision in response to anticipated effects of the solution on service users' general health [7.2].
- There should be widespread acceptance and uptake for the solution across the integrated care system [7.3].
- Healthy living and prevention of disease should be core value of the integrated care system and should be well defined and understood by all stakeholders [7.6, 7.7].
- Key performance indicators should include improvements in healthy living [7.7].
- There should be clear incentives and plans for implementing solutions based on primary, secondary and tertiary prevention of disease [7.7, 7.9].
- The system should pay close attention to users' adherence to and satisfaction with their integrated care plan [7.8].

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Evaluation core factor: The solution should increase the efficiency in care

Summary

Person-centred Technology-based Solutions and efficiency in care

Person-centred Technology-based Solutions can make integrated care more efficient. It allows care providers to better coordinate care plans [4.1] without the need to be in the same physical space [4.3]. Communication in the care ecosystem can be more dynamic, sharing different types of data [4.4]. Better communication and more data, distributed with appropriate detail to the different stakeholders [4.9], might lead to early detection of issues, prevention, more appropriate access to [4.6] and use of the public health structures resources (e.g., delay hospitalisation and institutionalisation) [4.5]. The monitoring of outcomes related to efficiency (costs-benefits) is important for care organisations [4.8], considering the additional costs for training, the impact on workload distribution [4.2] and the time needed for end-users to easily use the system and to contribute to the solution's effectiveness [4.7, 4.10].

Recommendations

- It is important to have a clear idea about the goals that organisations want to achieve in terms of "efficiency" before adopting a technology-based person-centred solution [6.1]. Measurable performance indicators should be defined [6.3, 6.6, 6.7].
- Although cost efficiency is a core factor for adoption of technology-based person-centred solutions [6.5], the solution should not impact negatively on the quality of life of the end users, but seek to enhance it. Any cost-benefit analysis should take this aspect into account [6.2], including those made by policymakers and commissioning bodies [6.10].
- The impact on the workload of care staff should be considered in a cost-benefit analysis [6.4].
- A win-win situation should be sought in which the solution allows for more efficiency in the presence of higher health outcomes [6.9].
- High speed and reliable connectivity and a wider technology infrastructure needs to be in place to guarantee efficiency [6.8].

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5 Models and tools for the adoption, upscaling, and transfer of person-centred technology in integrated care

In this chapter (Chapter Five), we are reporting the findings from the present research. Section 5.1 describes the factors that should be considered when adopting person-centred technology to support and mediate the integration of health and social care delivery, its management or improvement. These factors are clustered under the following headings: conceptualisation, contextualisation, implementation, and evaluation, which represent the stages of any technology adoption process in complex organisations or processes. In Section 5.2, we introduce a self-assessment tool which managers and developers can use to keep track of the extent to which they have considered the factors listed in the previous section. Section 5.3 describes the final and improved version of the 4-Wheel Framework introduced in D3.2.

5.1 Updated list of factors

During the process outlined above the following additional impacting factors compared to the previous list as reported in D3.2. were retrieved, others were reformulated:

Conceptualisation

- *New*: The potential beneficiaries self-identify themselves in the expected benefits.
- *New*: The representativeness of the sample for the beneficiary group is considered.
- *New*: The variety in apparently homogeneous groups is considered.
- *Reformulated*: The needs and interests of the beneficiary groups *[made plural]* are well defined across the care domains (health, social, education, etc.)
- *New*: The envisaged solution enhances the role of the car receiver and his/her care network.
- *New*: The interests of different stakeholders are well aligned.
- *New*: The envisaged solution provides health literacy information.

Contextualisation

- *New*: The levels of health literacy in the ecosystem are considered.
- *New*: The presence of multidisciplinary teams and approaches is considered.
- *New*: The concept solution fosters stakeholder involvement and participation in decision making.
- *New*: The system needs to be willing to adapt to the effects of the solution e.g. availability of ancillary service.

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Implementation

- *New*: There is an emergency scenario in case of unpredictable events.
- *New*: The solution displays the information in a way that users can understand and want to receive.

Evaluation

- *New*: The expected efficiency gain is a win-win situation for all.
- *New*: Patient satisfaction can be measured in different ways.

The complete list of impacting factors has been reviewed by the team and harmonised in the way the factors are presented, namely as statements belonging to a potential check list. The final list, including a reference per factor on its particular relevance for upscaling and transferring integrated care, is included in Annex 3 to this deliverable.

5.2 Self-assessment tools

The list of relevant factors to consider in the different stages of adopting, upscaling or transferring technology based persons-centred solutions in integrated care can be used as a basis for the development of a useful tool, such as a self-assessment framework tool for organisations aiming at adopting technology-based solutions in their care pathways. For the different stages the assessment criteria would be slightly different as indicated in Table 14.

Table 14 Assessment criteria for different factors

Stage	Assessment criteria	Scale			
Conceptualisation	Factors are considered	Not considered	Partially considered	Fully considered	Not relevant
Contextualisation	Factors are analysed	Not analysed	Partially analysed	Fully analysed	Not relevant
Implementation	Factors are managed	Not managed	Partially managed	Fully managed	Not relevant
Evaluation	Factors are assessed	Not assessed	Partially assessed	Fully assessed	Not relevant

The proposed pre-validated draft self-assessment tool is included in Annex 4.

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A similar tool could be developed as an online tool that different people in the organisation can have access to and collaborate on. In addition, a column could be added in which teams could add the strategies or actions to reach a higher level of confidence that the factors is sufficiently considered, analysed, managed or assessed.

It would require more time and resources to validate the tool with a significant number of organisations, but this could definitely be considered as a next step.

A second tool could be made for developers seeking to enhance the transferability of the solutions that they are developing. As is clearly indicated in the list in Annex 3, there are factors that have core relevance for those aiming at transferring a solution that is developed elsewhere in a different political and social environment with a different culture and organisation of care. The problems and the needs might be the same, but the answers to those needs might not necessarily be. For developers of person-centred technology-based solutions it is important to consider right from the start of their development work which factors are particularly relevant to consider in such a transfer process. Addressing them appropriately will turn these factors into facilitators for transfer instead of barriers. An example is considering right from the start the fact that the solution might need to work with different language channels, or accessibility options. Such critical factors might inform the development of a developers check list to enhance wider uptake of their solutions across Europe and worldwide.

5.3 The final version of the 4 Wheel framework

Based on the feedback received during the further implementation of T3.2. as well as the outcomes of the survey and the workshops, some changes were made to the 4-Wheel Framework, harmonising the language and better reflecting the stages of the adoption process. Figure 5 shows the final version.

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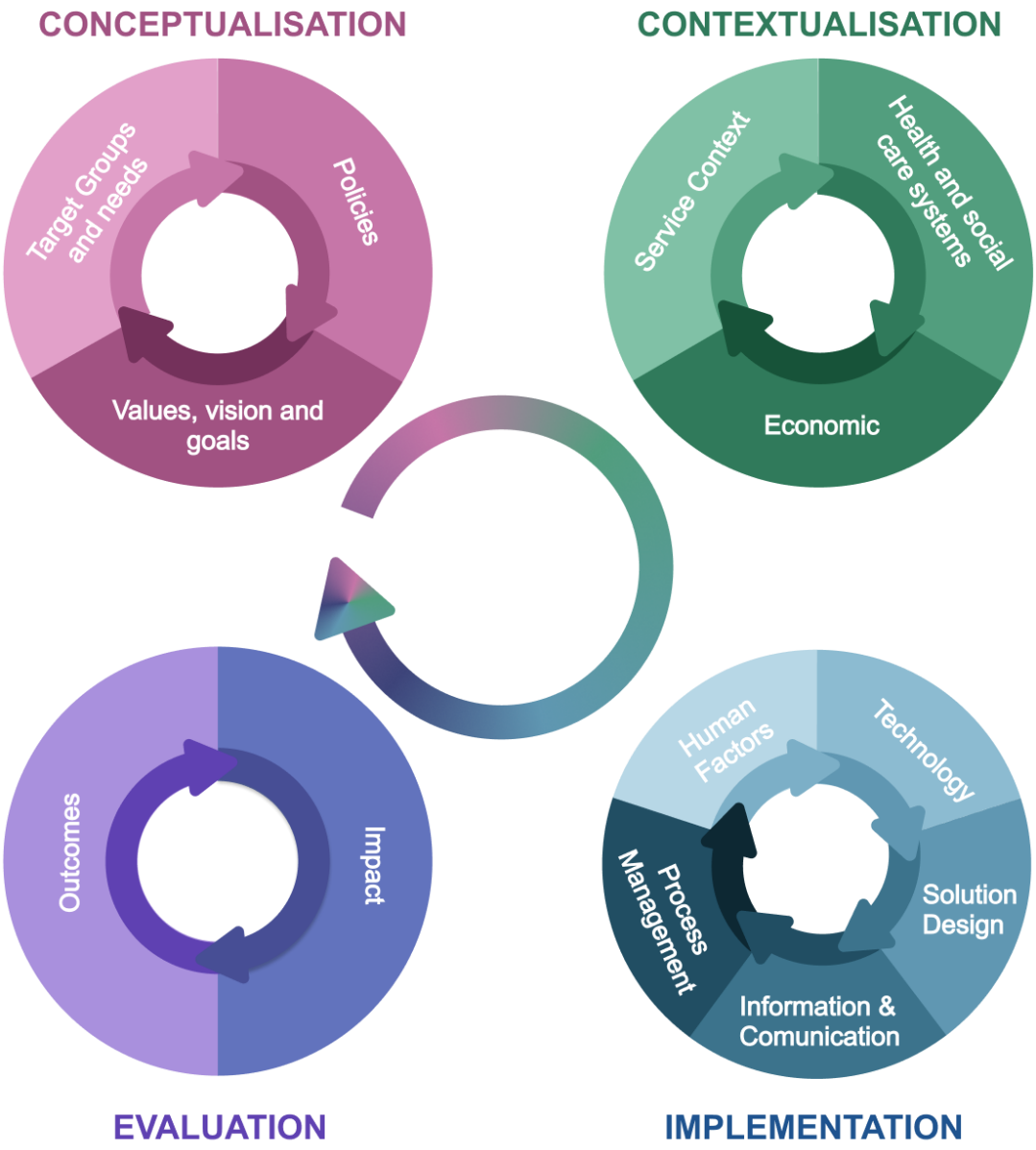

Figure 5 Final version of the 4-Wheel Framework model

The 4-Wheel framework model thus provides an overview of domains of factors that determine the success or failure of the adoption of person-centred technology-based solutions to support and mediate integrated care. Together with the detailed self-assessment tool it constitutes a valuable support to decision makers, including those working on the further upscaling and transfer of the SHAPES platform and its solutions.

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6 Conclusions: Strengths, limitations, and recommendations

In the current chapter (Chapter Six), we will evaluate the strengths and limitations of the results of our work (Section **Error! Reference source not found.**) and offer a list of d etailed recommendations for the upscaling and transfer of the SHAPES platform and digital devices (Section 6.2.).

6.1 Evaluating the strengths and limitations of D3.3

6.1.1 Strengths

D3.3 has provided a comprehensive and practical guide for the technology-enabled deployment, management and scaling up of integrated care delivery. D3.3 is an evidence-based piece of work which took a flexible and multi-method data gathering approach. As described in Chapter 4 (Ranking and refining impacting factors), D3.3 built on a thorough review of the existing literature (D3.2), as well as a study of integrated care models in different EU Member States. This approach enabled us to take into account the diversity of technology-mediated integrated care models in Europe, which builds on the work presented in *D3.1 SHAPES Ecological Organisation Models*. Capturing the trends in integrated care delivery in Europe will support SHAPES in ensuring that the Platform will facilitate the scaling-up of integrated care delivery across the EU.

The deliverable has outlined the facilitators, barriers and risk factors impacting the implementation and extension of integrated care delivery that relevant parties (e.g., developers, care managers or policy makers) should consider carefully before making changes to the current system by introducing person-centred technology. We have drafted a self-assessment tool that can be used by various parties to ensure that their vision will likely be successful before the current system is altered by technology adoption. This is important because it will limit disruption to the current operational processes and facilitate successful innovation.

Lastly, D3.3 works as a standalone report which interested parties can access as soon as it has been made available.

6.1.2 Limitations

As described in Chapter 3, the additional case studies selected for this deliverable needed to fulfil the following set of criteria: technologies used needed to be

a. patient/ user-centric,
b. part of operational service delivery models,
c. connect different actors in a care ecosystem,
d. deployed over a longer period of time and

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e. evaluated from the perspective of different stakeholders.

As it was difficult to find many models that met all criteria, we eventually decided to include more experimental, short-term projects. Although the findings presented in this deliverable provide valuable insights and practical guidance for the successful integration of health and social care delivery, we were unable to assess the long-term success and sustainability of these models. We suggest that longitudinal studies of integrated health and social care models mediated by technology are needed to examine the implications of technology adoption for the outcomes, the sustainability and the transferability of integrated care models across various socio-cultural and economic contexts.

Task 3.2 explored the role of technology as mediator of the deployment, sustainability and transferability of integrated care models. What this task has not taken into account is the policy context for integrated health and social care delivery in EU Member States. This work will be done in a subsequent task (Task 3.3) which builds on the work of T3.2 and which will "analyse the policies and political strategies aiming to make integrated health and social ecosystems work together and determine how policy-making can improve the continuity of care, reduce barriers to integrated care, diminish the fragmentation of health and social care systems and, ultimately contribute to the sustainability of health and care systems across Europe" (DoA, p. 23). Task 3.3 will also include relevant findings from the large-scale piloting activities which, due to time constraints, D3.3 has not been able to draw on.

6.2 Recommendations for SHAPES

6.2.1 Supporting the development of the SHAPES Platform

Europe's population has been ageing, which has implications for both the health of the individual, and for their health and social care provided by formal and informal caregivers. SHAPES seeks to offer a technology-mediated solution to support older individuals who experience various health conditions, such as multiple morbidities, reduced mobility, and cognitive abilities, to continue living independently in their own homes. Furthermore, SHAPES aims to promote active and healthy ageing, and a marked improvement of people's quality of life. To achieve these goals, SHAPES is creating a platform which integrates a series of smart digital devices to collect user data to enable the personalisation of devices used to monitor their condition, or to support daily routines. Moreover, the platform also acts as a mediator to make the operational processes within the health and social care sectors more efficient which will have implications for cost and long-term sustainability of care delivery.

The platform needs to be both responsive to users' needs and preferences, and to work across multiple and varied European contexts taking into consideration each country's health and social care environment, and its socio-cultural and economic contexts. This requires a platform which is standardised, interoperable, adaptable, and scalable.

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The research done in Task 3.2 is embedded in the work undertaken in previous tasks, which included analysing the broader context of health and social care delivery in EU Member States (*D3.1 SHAPES Ecological Organisation Models*), the individual realities of older people (*D2.1*) and user-centred requirements for the SHAPES Platform (*D3.9 User Requirements for the SHAPES Platform*). The findings from these tasks provided a) a comprehensive analysis of the macro socio-cultural and economic context within which the SHAPES Platform will operate, b) the needs and preferences older people have in relation to digital devices and c) range of functional and non-functional requirements (security, ethical and legal, health system, business and technical) that the Platform needs to fulfil. This context needs to be taken into consideration to ensure that the selected technologies can successfully mediate the delivery of integrated care in different EU member states.

6.2.2 Recommendations for the SHAPES Platform

Building on these tasks, D3.3 provides practical guidance for the successful deployment, scaling-up and transfer of person-centred technology in integrated care programmes. D3.3 has produced a comprehensive set of recommendations (see Section 4.3.2) resulting from the research activities described in Chapter **Error! Reference source not found.**. D3.3 e mphasised that technological innovations for the scaling up of integrated care delivery must place the user in its centre. Thus, the SHAPES Platform must ensure that these technologies meet the need of each individual user. To achieve this, we suggest an evidence-based, co-design approach where design involves all relevant parties (e.g., patients, care providers, health administrators). As we have highlighted in this deliverable, the successful integration of care services rests on the functionality of the technologies. Unless devices are designed to be intuitive, user-friendly, inclusive, and easy to access, users will likely be less inclined to use them.

As highlighted in Section 6.1.2 (Limitations), some of the integrated care models introduced in both D3.2 and D3.3 were experimental and short-lived and therefore, inferences about long-term sustainability were not possible. Therefore, the technologies used in SHAPES to promote the integration of pan-European health and care sectors should be subject to evaluation and adaptation, based on the needs of the user and the unique care environments across the EU.

The findings in D3.3 highlighted the importance of accessibility and affordability of technologies promoting integrated care delivery. Accessibility and affordability are related to sustainability which, as stated, is one of the requirements the SHAPES Platform needs to fulfil. Providing specific recommendations in this realm was beyond the scope of D3.3. However, the tasks in *WP7 Market Shaping, Scale-up Business Models and Socio-Economic Impact* will perform market and socio-economic sustainability analyses resulting in “SHAPES Ecosystem Business Models [for the] large-scale deployment and adoption” (DoA, p. 44). Therefore, to ensure accessibility and affordability of technologies mediating integrated care delivery, the SHAPES Platform needs to consider the strategic guidance offered in *D7.4 SHAPES Business Plan* (CO).

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D3.3 has resulted in several practical tools designed to guide developers, managers and policy makers in the conceptualisation, contextualisation, implementation, and evaluation of the proposed technologies. The SHAPES Platform should integrate these tools and make them available to developers, care service administrators, and policy makers seeking to find evidence-based approaches to promote the integration of siloed health and care system.

6.2.3 Recommendations for developers, care service administrators, and policy makers

All interested parties seeking to develop, implement or manage person-centred technology-based solutions mediating the provision of integrated care should consult the self-assessment checklist (Annex 4) to ensure that the design of the solution has taken into consideration the factors provided in this deliverable. They should consider that some factors will be less relevant than others.

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7 Ethical Requirements Check

Ethical issue (corresponding number of D8.4 subsection in parenthesis)	How we have taken this into account in this deliverable (if relevant)
Fundamental Rights (3.1)	N / A
Biomedical Ethics and Ethics of Care (3.2)	N / A
CRPD and supported decision-making (3.3)	N / A
Capabilities approach (3.4)	N / A
Sustainable Development and CSR (4.1)	N / A
Customer logic approach (4.2)	N / A
Artificial intelligence (4.3)	N / A
Digital transformation (4.4)	N / A
Privacy and data protection (5)	Informants for this study have signed a consent form with information on the data protection policy of the project.
Cyber security and resilience (6)	N / A
Digital inclusion (7.1)	N / A
The moral division of labor (7.2)	N / A
Care givers and welfare technology (7.3)	N / A
Movement of caregivers across Europe (7.4)	N / A

Comments: _____

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Annex 1. Additional case reports

Please find the full list of cases examined under Task 3.2. followed by the detailed description of those added for this deliverable.

Regarding the column “Status”:

- TI: Technology implemented and embedded in care organisation
- TD: Technology developed, piloted, and evaluated but not yet embedded in daily operation of care organisations yet
- NTY: Policy developed but limited use of technology yet

Case n°	Name	Country	Technology	Status	Del.
Case 1	Remote Health Pathways BP scale-up	Scotland, UK	Blood pressure meter and remote communication	TI	3.2.
Case 2	Attend Anywhere/Near Me	Scotland, UK	Remote video consultation	TI	3.2.
Case 3	MedGuide	Cyprus	Intelligent pill boxes, digital platform, social communication	TD	3.2.
Case 4	Pro-ACT	Leinster, Ireland	eHealth solution (HW&SW) for self-management and data sharing	TD	3.2.
Case 5	CleverCogs	Scotland, UK	Client supporting software suite on tablet	TI	3.2.
Case 6	Healthy Kinzigtal	Baden-Württemberg, Germany		NTY	3.2.
Case 7	Healthy Wirral	Wirral Peninsula, UK	On-line integrated health record	TI	3.2.
Case 8	Patient data management and reporting system	Mallorca, Spain	Patient management and data sharing platform	TI	3.2.
Case 9	FrailSafe	Cyprus	Different sensors and applications connected to a platform to monitor frailty	TD	3.2.

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Case n°	Name	Country	Technology	Status	Del.
Case 10	VideoVisit	Finland	Remote video consultation	TI	3.2.
Case 11	ULS MATOSINHOS	Porto, PT	Telehealth and remote monitoring linked to a central data repository	TI	3.2.
Case 12	LOCS	Valencia, Spain	Indoor and outdoor monitoring through sensors and GPS	TD	3.2.
Case 13	Post Stoke platform	Estonia	Patient management and data sharing platform	TD	3.2.
Additional case reports					
Case 14	E.Ca.R.E. (Elderly home Care Residential Engagement)	Italy	Tablet with a platform integrating data from smart home and health monitoring sensors. Communication software, Games.	TD	3.3.
Case 15	LivingLab - Dementia	Italy	Tablets equipped with apps for cognitive stimulation, voice assistants (Alexa), smartphones, GPS trackers and smartwatches	TD	3.3.
Case 16	Telemonitoring of patients with advanced heart failure	Czech Republic	A telemonitoring system with monitoring devices	TI	3.3.
Case 17	Tele-monitoring of patients with AMI and newly diagnosed diabetes	Czech Republic	A telemonitoring system with monitoring devices	TI	3.3.

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ID	Case 14
Name of the initiative/solution	**E.CA.R.E.** (Elderly home Care Residential Engagement)
Country	Italy - Austria
Region	Veneto (Treviso, Belluno), Friuli-Venezia Giulia (Pordenone), Kärnten (Klagenfurt)
Responsible organization	*ISRAA* – Istituto per Servizi di Ricovero e Assistenza agli Anziani (Treviso) *SER.S.A.* – Servizi Sociali Assistenziali (Belluno) (partner) *A.S.P. UMBERTO I* – (Pordenone) (partner) *ALPEN-ADRIA UNIVERSITÄT – Klagenfurt University (*Kärnten*) (consulting and evaluation of the impact of the results)*
Contact person	Dr. Oscar Zanutto
Role in the organization	ISRAA (since 2000) Head of ISRAA's European Projects Department FABER Ambassador of Treviso' Aging 2.0 Network (since 2020)
Website	E.CA.R.E. (ecareproject.eu)
Keywords	Digital health, community involvement,
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	ISTAT's 2018 annual report notes that in Italy, 13% of the general population lives alone, which rises to 16% of the population between the ages of 55 and 74. This percentage more than doubles (38.3%) among those older than 75 years. The same report highlights that almost 40% of those over 75 have neither relatives nor friends, and 11.7% of them only have a neighbour that they can ask for support. Based on these figures, the E.CA.R.E. project aims to create and validate a model of intervention aiming to reduce isolation and loneliness in older people living alone or in remote areas. The E.CA.R.E. model falls into the category of "community-based interventions", as it seeks to promote well-being and independence in isolated older people. This is done through the promotion of social peer network and through the creation of new connections and community. In addition, E.CA.R.E. aims to support people's participation in society through digital tools that facilitate the victual continuation and deepening of relationships that were started offline. The E.CA.R.E. project began in 2018 as an expansion of the "Self-Act Project". Various projects participants, including users and caregivers, were recruited through neighbourhood involvement strongly focused on the role volunteers could provide. Tablets, equipped with a platform and an ad hoc app, were given to families involved in the project. These devices facilitated the following activities and capabilities: firstly, to connect the person with their social surroundings via e-learning subjects, games and entertainment, and video-communication. Secondly, these tablets were connected with smart home sensors, which enabled the recording of vital parameters facilitating real time connections with the care provider. Finally, smartwatches contributed to the

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	effort to ensure a high level of security by connecting users to their network. All participants were supported in the use of these Bluetooth-connected devices (scales, blood pressure and glucose meters) through a specific training course. The project, which was funded by the Interreg Italy-Austria program, is the result of a collaboration between Italian institutions (see above) and the University of Klagenfurt. The project has also been sponsored and supported by the respective municipalities (associated partners) and social departments.
Target group and care ecosystem involved	The sample involved includes 166 participants between 65 and 85 years old and their caregivers. They were recruited through public promotional meetings and word-of-mouth. All participants met the inclusion criterion that they had to live alone either in their own homes or beneficiaries of public housing within the 3 pilot sites: 80 people in Treviso, 50 people in Belluno, 16 people in Pordenone and 20 people in Klagenfurt. Therefore, to support all those involved in this process and to activate networks, E.Ca.R.E. has created the following support teams for each site: One community manager: an external professional who observes and takes charge of monitoring, coordinating and keeping the network active. One “Super Citizen”: a person in the neighbourhood who is more familiar with the use of technological devices. This person support other citizens if they have doubts or difficulties using the tablet and smartwatches; an internal observer who had the following roles: • to engage other citizens through peer-to-peer involvement; • to animate the network; • to provide feedback to the community manager both on the progress of the network and on the quality and quantity of interactions between the participants, online (cold channel) or face-to-face (hot channel). Two or more volunteers who work in close collaboration with the community manager. The volunteers had the following tasks: • to help the end user in the everyday use of technology • to help find solutions for problems resulting from the use of the devices Five or more citizens, including end-users, who participated in recreational and social activities (Ex: baking cakes, hosting lunches or snacks in the garden, giving a ride to others, etc.) For the recruitment of volunteers, each partner of E.Ca.R.E. has utilised existing relationships and collaborations with local organisations involved in the project (citizens, volunteer organisations, religious communities, other associations of citizens present in the project area), as well as the volunteers already active in

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	each partner organization. All of them were located in the same neighbourhood or nearby. Project participants can be categorised as follows: • older people taking part in the project, formal and informal caregivers, relatives who are not involved in care and neighbours or other people who are in regular contact with people involved in the project. • project employees and volunteers. • national government, local health services, companies and associations (in most cases public or not-for-profit) who are involved in providing care as part of their mission or under public contract.
Functioning	As a start, E.Ca.R.E. selected and trained several care professionals per site to support participants throughout the project and to guide them in making healthier lifestyle choices. First, through a "Train the Trainer" programme, care professionals were equipped with the basic knowledge, skills, and practical experience required to deliver a programme promoting healthy lifestyle choices to older people. The training focused on the following: self-care, attitudes, mindfulness practices, compassion, and changing habits, healthy eating, physical activity, relationships, use of technology for health monitoring, including through practical examples. Volunteers needed to meet the minimum requirement of being familiar with the devices used during the project. They subsequently received training on the following topics: healthy lifestyles, health coaching, guided conversation techniques and motivational interviewing, and strategies for social animation. They also learned about cognitive, motor-function-based, and creative manual socialization activities. Finally, they were provided with a short manual that illustrated the functions, methods of access and use of the App "James E.CA.R.E", "James Chat" and the platform "James". A copy of the user manual on the equipment created for end users was also available on request, which facilitated a better understanding of the devices. Consequently, volunteers were better equipped to offer basic support to participants. The manual, which acted as an additional guide to the training, also included a section on the technology used in the project. Volunteers interviewed the older project participants using a "Quality of Life" questionnaire to better understand certain aspects of their lives, such as their housing situation, ability to manage their daily routines autonomously, and their relationship with the social sector. In addition, participants were asked about leisure activities, physical abilities, state of health and well-being. Then, before receiving training in the use of technology, the participants were again interviewed using a personal profiling tool. The findings from the interviews were used to create personal participant profiles. In addition, a map of each participant's community was created to identify currently existing resources (stakeholders) and additional non human resources identified as necessary or desired.

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	Next, senior participants' level of digital competencies was assessed through the E.CA.R.E tool, which was based on the Digital Competence Framework 2.0 (DigComp 2.0) developed by the European Union's Joint Research Centre. Then, the E.CA.R.E. project invited participants to attend workshops themed as follows: • Use of technology; • Awareness of lifestyle habits and making healthier lifestyle choices. These workshops involved six training cycles that participants were invited to attend following an initial assessment. The duration of the workshops was flexible and dependent on participants' technological literacy and needs. They also allowed for moments of knowledge and exchange between participants. To facilitate the learning process, training was delivered through interconnected and interchangeable modules. The nature of the modules enabled trainers to adapt how the content was delivered and allowed them to pre- or postpone certain themes, to repeat or focus on specific sections as required. During the workshops, a peer-to-peer approach was taken whereby more advanced participants trained participants who were less familiar with the technological devices. This approach was encouraged for the following reasons: to better manage participants' varying levels of familiarity with the technological devices, to facilitate socialization, and to capitalise on the communicative, socializing and sometimes technical skills of some of the participating citizens, defined as super-citizens, in the process of community building. To further promote socialization, training also included practice sections in pairs or small groups. Here, volunteers played a vital role in providing support as required. Then, participants who had received training started to use digital devices to further promote social interactions and to support the formation of relationships. During these sessions, physical and virtual encounters took place on an alternating basis. The community manager of each pilot site, in collaboration with super-citizens and volunteers, was tasked with supporting the communication processes, animating conversations and facilitating and mediating exchanges where necessary. Participants had the opportunity to start individual chats and to autonomously create conversation groups that met their interests, to organise meetings or other social activities, or to just talk to each other in small groups of two or more. At the end of each training cycle, there were follow-up meetings intended for review, practice and resolution of concerns or difficulties encountered during training. As participants became more familiar with the devices used and with each other, they used the communication functions (chat, video call, voice call) of the devices more intensively. These devices have also facilitated follow-up meetings, review sessions, individual and group consultations which were curtailed during the COVID-19-induced lockdown. Remote support also helped to ensure that participants, who encountered difficulties or barriers to using the devices during the project, would not feel abandoned.

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Economic Sustainability	The project had a total budget of €810,864.78, of which €675,168.19 came from the European Regional Development Fund and 102.186,79 € came from national funds. All the devices used in the project were purchased and supplied by an Austrian company experienced in Ambient Assisted Living in line with the procurement legislation of the electronic market and specific procurement procedures, taking into account specific requirements. Although the E.CA.R.E. project was considered successful, it was unclear how to expand the service sustainably within a generalist health and social care system. There are two options as envisaged by the researchers: Option One: a privately paid monthly or annual subscription service, as already exists in Europe. This membership would entitle users to access equipment and support staff. Option Two: financing through regional authorities that decide to adopt the service which would promote prevention of increasing frailty and support older people who wish to continue to live independently in their own home.
SOLUTION EVALUATION	
Actual use and evaluation of the outcomes	The impact of the piloting activities was measured by evaluating how participants' quality of life change after they started to use the devices. The evaluation was done through the "Quality of Life" tool used for the initial and final screening of the citizens involved in the project. This tool provided an overview of the life situation of each participant. Particular attention was paid to relationships, health and psycho-physical well-being. Participants were asked to answer a series of questions about family composition, quality and quantity of friendships, diseases, intake of drugs, frequency of GP visits, diet and physical activity. Following the thorough analysis of existing tools an analytical tool called Social Return on Investment (SROI) was adopted. This was done because it was considered more effective in a context where the results depend on the collaboration of a large number of individual and institutional actors, and where the impact on the health of people assisted depends on the development of a mixed formal and informal network of care providers. The main objective of the project was to verify and evaluate the impact of the introduction of an electronic communication system both in the life of older people at risk of social isolation and on their social environment. All impact assessments were in line with the EU's General Data Protection Regulation (GDPR). The web-based software that oversees the entire system was installed on the organization's servers. All phases of data collection and analysis adhered to the requirements of the GDPR. The research was approved by the Ethics Commission of the Veneto Region.
Expectations	The impact of the project should be evaluated on two different levels. Regarding older users, the introduction of technology in their daily lives was intended to reduce the sense of loneliness. Overall, participants reported that they felt less lonely since they started to use the devices. Yet, their attitudes towards adopting

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	the technology varied ranging from scepticism on the one end to enthusiasm on the other. Regarding institutions, it was hoped that the integration of digital devices would prompt significant changes to the ways in which homecare service carry out routine activities and beyond, a redesign of the homecare service system. Yet, these changes were hindered primarily due to regulatory and normative barriers.
Further development of the solution	The expansion of the project is currently in progress in collaboration with the local health authority of Treviso. This is an evolution of E.CA.R.E., thanks to the strong commitment of core partners. This will result in an alliance that seeks to unite the component of social protection that E.CA.R.E. has generated with specific areas of pathology identified in the health sector. The aim is to create a form of hybrid care model by integrating technologies capable of remote diagnosis, remote assistance, etc.
RECOMMENDATIONS	
Lessons Learned	At the operational level, the implementing team was very satisfied regarding the creation of online groups, the proposed content, the inclusion of technology, etc. However, there were two challenges facing the project: One, due to limited funds, customisability of the tools was also limited, which did not always correspond with the needs of the users. Two, technological maturity. Today's technology, despite only a few years having passed, is more efficient and cheaper than in 2018, which requires a continuous review of configurations. In addition, there are several factors that should be considered for the introduction of devices into people's lives. Co-design, i.e. the involvement of users in the design of user interfaces, is crucial. It is necessary to combine co-design with mock up and pilots before the wider implementation of such devices. Moreover, some older users may already be accustomed to certain IT devices (e.g. WhatsApp) and asking them to use a similar but slightly different tool can be challenging and changes will take time. Lastly, policy-makers should also be included in the design of more sustainable health and care systems based on the adoption of technology and the new challenges these bring with them.
Recommendations	It is critical that the ways in which people are introduced to technology are tailored to their needs and capabilities. Moreover, there is scope for creating greater awareness of technology as a means for supporting activities of self-care. It should be taken into consideration that there is a need for affordable devices. Such devices already exist on the market, and people may already be aware of their existence. Rather than investing in expensive technologies that are advanced but far from everyday life, it would be better to use those that are affordable and available on the general market.

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ID	Case 15
Name of the initiative/solution	***LivingLab - Dementia***
Country	Italy
Region	Bologna, Emilia-Romagna
Responsible organization	Centro Disturbi Cognitivi e Demenze (CDCD) "Poliambulatorio Byron" (Centre for Cognitive Decay and Dementia)
Contact person	(1) Simona Linarello - (2) Elisa Ferriani
Role in the organization	(1) Geriatrician, Medical Manager (since 2012) (2) Psychologist
Website	/
Keywords	
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	The treatment of patients with dementia involves several areas of care involving the collaboration of health and social care professionals. Based on insights from the scientific literature on dementia care, equal importance is placed on medical factors, training and solidarity to slow down, compensate for or contain the manifestations of the various forms of dementia. There are many variables to consider when taking care of a patient with dementia who can continue to reside at home but who needs assistance. Although there is no definitive therapy for the treatment of dementia yet, a combination of medication and psychosocial intervention has shown the most promising results. Psychosocial interventions are non-pharmacological treatments that do not involve the typical side effects of drugs. Yet, non-pharmacological interventions should be recommended based on the degree of illness. Asking patients to participate in activities that are not appropriate for their individual condition can be frustrating and may aggravate cognitive and affective-behavioural problems. However, it is possible to significantly improve the quality of life of the patient-caregiver dyad offering them a commensurate psychosocial intervention. The LivingLab project is inspired by the LivingLab model that exists at European level. LivingLab takes a person-centric approach and seeks to rapidly respond to the – expressed and unexpressed - needs of the individual person without investing on long-term pilot projects. The introduction of technological devices, both those available on the common market and those specifically designed, made it possible to create a highly personalized kit for each participant to stimulate residual skills to improve their quality of life. Tablets equipped with apps for cognitive stimulation, voice assistants (Alexa), smartphones, GPS trackers and smartwatches were the main devices used in this project. These devices helped to promote and maintain communication between the various care professionals enabling patient and informal caregivers to stay at home as much as possible.

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	LivingLab also sought to understand how to integrate the expertise and experience of multiple professional fields by facilitating the communication between, e.g. professionals as diverse as engineers, physiatrists, neurologists or psychologists. In fact, the project involved the Centre for Cognitive Decay and Dementia (CDCD) "Poliambulatorio Byron" in Bologna, the Department of Biomedical Engineering at the University of Bologna, the I.R.C.S.S. Neurology Department of Bologna, the Department of Clinical Psychology, the ASPHI Foundation, the DATeR territorial physiatry and the ARAD volunteer association of Bologna. The project ran from January 2020 until the end of 2021. Due to the Covid-19 pandemic, the clinical data collected are still being processed.
Target group and care ecosystem involved	Eight older people from the Bologna area with dementia and their families were involved. Unfortunately, due to the Covid-19 pandemic and the death of one participant, the sample was reduced to 5 people. Participants were recruited from the Bologna CDCD user pool and they were assisted, supported, and trained by a team of psychologists, health care assistants and computer technicians.
Functioning	The first phase of the project involved the training of health care assistants, who were assigned to the participants and their caregivers. These training sessions were carried out in workplaces enabling the health assistants to familiarise themselves with the technology used in the project. The training was conducted by the Asphi Foundation of Bologna and by the clinical staff of the local health authority. Unfortunately, the covid pandemic required that the in-person training was continued online, with some difficulties related to connection issues and the lack of hand-on experience with the devices. At the end of the first wave of the pandemic, user-caregiver pairs were met by the project team who gathered information about the lives of the participants. Subsequently, their needs were analysed, then shared and discussed among clinical professionals. Later, specific integrated goals were formulated and shared with the bioengineering informatics team. The technicians created and delivered a "technological kit" tailored to the needs of each individual user and subsequently, provided specific training. The work of the Health Assistants and their continuous relationship with the work team made it possible to carry out a monitoring phase. Due to both performance reasons and deterioration of pathologies required certain modifications or adaptations of the kit.
Economic Sustainability	The project was funded by the "Fondazione del Monte" with 10.000€, spent mainly to purchase devices and to finance internships for computer technicians of the university. With the support of several Italian associations, that were invited to actively participate, there are discussions about how to transform this project into a public service. These associations, including AIAS Bologna Onlus, deal with eCare health, telemedicine and assistive technologies.
SOLUTION EVALUATION	

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Actual use and evaluation of the outcomes	Clinical assessments, mainly neuropsychological, were conducted on both cognitive and motor aspects. Each professional involved used their own batteries of tests. A first session of assessments (T0) was carried out at the beginning of the project, before the covid-19 pandemic; by the end of 2021 the same assessments (T1) will be repeated, and datas will be available through local channels.
Expectations	Expectations were very high, both from the users and from the clinical-technical team. As a result of the introduction of the devices and the continued presence of support and care inside and outside the home, participants felt more satisfied and motivated. Participation in the project also demonstrated to the clinical-technical team the benefits of introducing technology into people's homes. High levels of customization of technological devices enabled team members to quickly adapt the technology proposed according to the identified needs of user-caregiver couples. What was not anticipated was the performance anxiety of the users generated by the devices. They were often perceived as a foreign object and as something external, unpleasant, or persecutory, despite customization. Dementia will inevitably lead to functional, cognitive and physical decline, which prevented the team from finding a permanent solution. Thus, even a slight improvement can be a great accomplishment.
Further development of the solution	The project will be re-presented in the future in a broader and more structured way focusing on a new model of care. This will require new collaborations between individuals, organizations and institutions with technical expertise. Innovative and technological solutions are expected to support the key aim of the project, which is to provide rapid responses to individual needs. Moreover, new projects will seek to work with larger sample sizes.
RECOMMENDATIONS	
Lessons Learned	Innovative technological devices can assist medical professionals in providing personalised care which can improve a patient's quality of life, but it will be challenging to provide individualised care to as many people as possible. Moreover, for technology to work as intended, it needs to be tailored to the needs of the patient, and adequately support the work of care professionals. In fact, the introduction of technological devices remains one of the fundamental points to work on, to facilitate its inclusion in daily life. Moreover, it is necessary to expand the homecare sector with a greater presence of home care staff to provide relief to users and especially to their caregivers.
Recommendations	It is necessary to focus on multidisciplinarity, to combine skills, to create a bank of ideas and to promote the dialogue between health professionals and technicians. This can only enrich the value of responses to patients' needs. Dedicated services are needed each responding to the needs of its area of reference.

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ID	Case 15
	It is essential to focus more on the home care sector which requires the presence of additional support staff accompanying the introduction and use of technology. The monitoring phase facilitated by health care assistants is critically important because it allows for the modification of solutions as required. Lastly, it is necessary to consider that there will be changes and unforeseen issues to resolve; they should be seen as an opportunity to improve this kind of work.

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ID	Case 16
Name of the initiative/solution	**Telemonitoring of patients with advanced heart failure**
Country	Czech Republic
Region	Olomouc
Responsible organization	University Hospital Olomouc – Department: NÁRODNÍ TELEMEDICÍNSKÉ CENTRUM (NTMC)
Contact person	Zdenek Gütter, Michal Stybnar, Milos Taborsky
Role in the organization (include years of professional activity in the field)	As follows: Senior consultant; bioengineer; head of the internal clinic
Website	www.fnol.cz
Keywords	Heart failure, telemedicine
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	The experience is about the specific remote monitoring of patients with the following cardiovascular diseases: congestive heart failure, structural damage of the myocardium (muscular tissue of the heart) and dysfunction of the left heart chamber. This was done through the deployment of telehealth services and enhanced relevant medical protocols. This new practice aims to detect as many patients with cardiovascular diseases as possible, and to deploy telehealth services for monitoring and improved treatment of these patients. New protocols will be standardized, based on evaluation of results of the initial phase of the telemonitoring. The good practice was initiated by experienced cardiologists who recognized the need for improvement of care for patients with structural heart disease. A significant proportion of patients with cardiovascular diseases are seniors who frequently require also social care. Political support was sought on several levels, including support from regional government, national healthcare management authorities and medical societies. The good practice is financed through projects undertaken by the NTMC within EU structural funds, national funds and from resources of project partners. So far, the project has received approximately €75,000 and the number of concurrently monitored patients continues to increase. The monthly operational cost is approximately €500. It was possible to introduce the good practice with a minimum of required organisational changes within the hospital. It also complies with the national

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	healthcare system. It integrates medical practices and protocols into carefully selected telehealth services. A telemonitoring system was installed and monitoring devices have been distributed to selected patients who met the relevant criteria such as the condition of the patients. Medical procedures were upgraded accordingly to enable the clinical part of the good practice becoming routine**.**
Target group and care ecosystem involved	The new practice has two concrete goals: First, early detection of as many patients with heart failure as possible in time to prevent deterioration of both the patient's heart and their quality of life. Second, deployment of telehealth services for the optimization and standardization of new protocols for treatment, evaluation of results and selection of successful methods. The results will then be submitted to national and European medical societies (incl. European Society of Cardiology - ESC). At present, there are only guidelines of ESC for remote monitoring of patients with implants (Pacemaker/ICD). There is no explicit recommendation for serious diagnoses such as diabetes, hypertension, obesity, COPD, heart failure, among others. Patients who are monitored remotely for a range of cardiovascular diseases, such as chronic heart failure (CHF) with structural heart disease (mainly coronary artery disease or non-ischemic cardiomyopathy) and left ventricle (LV) dysfunction (LV ejection fraction - EF < 0.35) tend to fare better than patients who are treated through standard healthcare procedures such as pharmacological interventions and clinical follow-up. Palacky University Olomouc, which is connected to Olomouc University Hospital, has extensive experience in the management of chronic heart failure performed by medical and technical experts. The good practice spans all three pillars of the European Innovation Partnership on Active and Healthy Ageing (EIP on AHA). These pillars are as follows: Pillar I) Prevention, Screening & Early Diagnosis, with particular focus on prevention, early diagnosis of functional and cognitive decline. Pillar II) Care & Cure covering all areas but especially Protocols, Education for Health Workforce (comprehensive case management, multimorbidity, polypharmacy, frailty and remote monitoring). Pillar III) Active Ageing & Independent Living, focussing especially on Extending Active and Independent Living Through Open and Personalized Solutions. If there are ***evidence-based medicine*** (EBM) results, they shall be incorporated into relevant guidelines. These findings should also form part of a reimbursement scheme for each diagnosis in the Diagnosis Related Group (DRG) system for the classification of hospital cases used at national level.

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ID	Case 16
Functioning	Coverage: The project aims to cover 15% of the monitored population in the catchment area of the hospital. The practice enabled screening of the population with cardiovascular diseases it provides tools for the remote monitoring of patients with advanced heart failure (NYHA class III-IV, meaning patients that are markedly or severely limited during physical activity) who receive standard medical therapy (ESC guidelines), before and after heart transplantation. Further it covers population of patients with hemodynamic support (ventricular assist device - VAD) before orthotopic heart transplantation (OTS) or in long-term care. There has been no recognized practice or a protocol that would facilitate the monitoring of critical parameters if not by keeping the patient in hospital. There is a clear relationship between initial detection of CV diseases in the population via screening followed by specific individualized therapy, and the management of older people who are ill. Therefore, the practice has positive impact on health issues among the targeted population. It is also expected that morbidity, mortality, and quality of life of the targeted patients diagnosed with cardiovascular diseases will be improved. This new practice is associated with higher deployment of new technologies enabling the deployment of telehealth services. This will have a positive impact on the EU's economy as major parts of the telemonitoring system has been supplied by manufacturers from EU countries. In its initial phase, this good practice will likely need to overcome common issues, such as the sourcing of investments and resources to maintain the service. To ensure sustainability of the good practice, reimbursement involves negotiation with medical societies and national healthcare authorities. New telemonitoring jobs were created, and technical and management-oriented tasks required additional staff. With the increase of telemonitoring of people with cardiovascular diseases, more healthcare staff are required to provide (better quality) care for these additional patients.
Economic Sustainability	This good practice can be replicated in other hospitals providing medical services for patients with heart failure. Amended medical protocols have been under development since 2013, and it is planned to have them endorsed by medical societies in due course. Telemonitoring systems should facilitate the integration of devices commonly available on the market, which requires investments from hospitals. Reimbursement for healthcare services enhanced by telemonitoring systems is also more likely if medical protocols are recognised by the authorities.
SOLUTION EVALUATION	
Actual use and evaluation of the outcomes	The practice is in regular use. For its evaluation three methods are used as follows: - MAST - National methodology "Applicability of Good practices in the CR", developed in 2017, in project TACR - FNOL - MAFEIP.

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ID	Case 16
Expectations (Description and evaluation of the degree of objective's achievement)	The practice is innovative, both in terms of screening the general population for cardiovascular diseases, and especially in terms of the telemonitoring of patients before and after heart transplantation, patients with hemodynamic support before orthotopic heart transplantation or in long-term care. This would not be possible to perform without having the patients in hospital, which would require significantly higher expenses.
Further development of the solution	There are financial barriers to the screening or monitoring of all seniors at risk of cardiovascular diseases. In addition, there are also less pronounced, yet recorded obstacles put up by medical societies. An Evidence-Based Medicine approach providing solid data was chosen seeking to provide more clarity and to dispel doubts.
RECOMMENDATIONS	
Lessons Learned	The good practice approach revealed organisational challenges. Moreover, some patients had more complex needs which required a more personalised approach. Even though the good practice is only at the initial implementation stage, patients have responded positively. Medical personnel reported that they experienced a somewhat higher workload, and this will be subject to negotiations with national authorities regarding payment for these services.
Recommendations	As a result of EBM methods, the good practice is highly transferable to other regional or national hospitals. Transferability to other healthcare systems in the EU may also be possible, albeit with certain adjustments. The target population in the practice in Olomouc region reflects the standard population in EU countries with medium developed economy, occurrence of serious chronic diseases and medical risk stratification of population. Olomouc University Hospital has close relationships with other regional hospitals and healthcare providers. There is long term cooperation with several general practitioners and internists in the region who will be the initial recipients of the good practice before gradually expanding the initiative to other locations.

ID	Case 17
Name of the initiative/solution	**Tele-monitoring of patients with acute myocardial infarction (AMI) and newly diagnosed diabetes**
Country	Czech Republic
Region	Olomouc
Responsible organization	University Hospital Olomouc – Department: NÁRODNÍ TELEMEDICÍNSKÉ CENTRUM (NTMC)
Contact person	Zdenek Gütter, Michal Stybnar, Milos Taborsky

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ID	Case 17
Role in the organization (include years of professional activity in the field)	As follows: Senior consultant; bioengineer; head of the internal clinic
Website	www.fnol.cz
Keywords	Acute Myocardial Infarction (AMI), diabetes, telemedicine, tele-monitoring
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	Olomuc University Hospital introduced a telehealth service to facilitate the remote monitoring of older patients after discharge following hospitalisation for acute myocardial infarction (AMI) (i.e. a heart attack). These patients were also newly diagnosed with diabetes or may not have known that they have diabetes until they were admitted to hospital. These patients are at risk of relapse from AMI or unstable angina pectoris (i.e. a heart condition where blood flow to the heart is reduced) and may need further treatment, which may include chirurgic revascularisation (i.e. the restoration of blood flow to the heart). The good practice was initiated by experienced cardiologists who recognized the need for improvement of care for patients (mostly older people) hospitalized for AMI, seeking to facilitate the early detection of comorbidities frequently accompanying AMI. A significant proportion of patients with cardiovascular diseases are seniors who frequently require also social care. In a long-term perspective, the good practice seeks to reduce mortality rates and morbidity. Political support was sought from the regional government, the national healthcare management authorities and medical societies. The good practice is financed through funding for projects that NTMC is involved in which includes structural funds, national funds and co-funding from other project partners. So far, the project has received approximately €50,000 and continues to increase with the number of concurrently monitored patients. The monthly operational cost is approximately €400. It was possible to introduce the service with a minimum of organisational changes required within the hospital. It is also compliant with the national healthcare system. It integrates medical practices and protocols into carefully selected telehealth services. A telemonitoring system was installed and monitoring devices have been distributed to selected patients who met the relevant inclusion criteria related to the condition of the patients. Medical procedures were upgraded accordingly to enable the clinical part of the service to become part of daily routine.

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ID	Case 17
Target group and care ecosystem involved	As stated above, the service seeks to remotely monitor patients who were hospitalized for AMI, with or without ST-elevation, and who were recently diagnosed with diabetes mellitus or who did not know that they had diabetes until they were hospitalized for AMI. These group of patients are at risk of AMI relapse, unstable angina pectoris and who m ay require further treatment, such as revascularisation. Telehealth services are used in addition to current standard care practices which involves a 3-to-6-month follow-up provided through the outpatient department. Palacky University Olomouc, which is connected to Olomouc University Hospital, has extensive experience in treating AMI and associated comorbidities, such as diabetes. The practice was formulated as a result long-term experience of medical experts with the aim to early diagnose important change in health condition of patients and start treatment, which should result in decreasing overall cost in comparison to a standard practice. The targeted use of telemonitoring can support and improve disease management, and the early and flexible adjustment of treatment. The key point of the monitoring and treatment is to prevent hypoglycaemia episodes (a new recognized risk factor) and follow the long-term diabetes compensation by HbA1c level. The aim is that the practice becomes standard part of the protocol for treatment of AMI in patients with diabetes in the region with expansion potential to other regions. The good practice spans all three pillars of the European Innovation Partnership on Active and Healthy Ageing (EIP on AHA). These pillars are as follows: Pillar I) Prevention, Screening & Early Diagnosis, with particular focus on prevention, early diagnosis of functional and cognitive decline. Pillar II) Care & Cure covering all areas but especially Protocols, Education for Health Workforce (comprehensive case management, multimorbidity, polypharmacy, frailty and remote monitoring). Pillar III) Active Ageing & Independent Living, focussing especially on Extending Active and Independent Living Through Open and Personalized Solutions. If there are *evidence-based medicine* results, they shall be incorporated into relevant guidelines. These findings should also form part of a reimbursement scheme for each diagnosis in the Diagnosis Related Group (DRG) system for the classification of hospital cases used in the Czech Republic.
Functioning	Coverage: The project aims to cover 15% of the relevant population in the catchment territory of the hospital. The telemonitoring system facilitated the monitoring of glucose levels, both in situations of acute or long-term conditions. This has led to the following improvements: better health outcomes for patients, flexible management of peripheral artery disease (PAD) (a condition where blood flow to the arms and legs is reduced) treatment, better solutions for complications caused either by diet or disease. There is clear relationship between the initial detection of a disease and appropriate therapy based on individual needs, and the management of the target of group older people facing illness. The ability to detect and treat a disease at an early stage has produced the following outcomes: reduction in healthcare costs, reduction in visits to specialised hospital departments, and the stabilisation of the

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ID	Case 17
	patients' condition which has also reduced the need for social care. It is expected that patients' quality of life and safety will also improve. The new practice is associated with a greater usage of new technologies enabling the provision of telehealth services. This will have a positive impact on the EU's economy as major parts of the telemonitoring system have been supplied by manufacturers from EU countries. New telemonitoring jobs were created, and technical and management-oriented tasks required additional staff. With the increase of telemonitoring of people with diabetes, more healthcare staff are required to provide (better quality) care for these additional patients.
Economic Sustainability	This good practice can be replicated in other hospitals providing medical services for patients with AMI. Amended medical protocols have been under development since 2013, and it is planned to have them endorsed by medical societies in due course. Telemonitoring systems should facilitate the integration of devices commonly available on the market, which requires investments from hospitals. Reimbursement for healthcare services enhanced by telemonitoring systems is also more likely if medical protocols are recognised by the authorities.
SOLUTION EVALUATION	
Actual use and evaluation of the outcomes	The practice is in regular use. For its evaluation three methods are used as follows: MAST National methodology "Applicability of Good practices in the CR", developed in 2017, in the project TACR - FNOL MAFEIP.
Expectations (Description and evaluation of the degree of objective's achievement)	The practice is innovative, both in terms of screening and monitoring the general population, and in the long-term remote monitoring of blood glucose levels in patients with diabetes. This is expected to lead to better health outcomes for patients, greater flexibility in the management of peripheral artery disease (PAD), and to improved solutions for complications caused either by diet or disease.
Further development of the solution	There are financial barriers to the screening or monitoring of all seniors at risk of cardiovascular diseases. In addition, there are also less pronounced, yet recorded obstacles put up by medical societies. An Evidence-Based Medicine approach providing solid data was chosen seeking to provide more clarity and to dispel doubts.
RECOMMENDATIONS	
Lessons Learned	The good practice approach revealed organisational challenges. Moreover, some patients had more complex needs which required a more personalised approach. Even though the service is only at the initial implementation stage, patients have responded positively. Medical personnel reported that they experienced a somewhat higher workload, and this will be subject to negotiations with national authorities regarding payment for these services.

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ID	Case 17
Recommendations	As a result of EBM methods, the good practice is highly transferable to other regional or national hospitals. Transferability to other healthcare systems in the EU may also be possible, albeit with certain adjustments. The target population in the practice in Olomouc region reflects the standard population in EU countries with a medium developed economy, the occurrence of serious chronic diseases and medical risk stratification of population. Olomouc University Hospital has close relationships with other regional hospitals and healthcare providers.

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Annex 2 Details input from the focus group participants

The solution should match the needs and interests of the beneficiary group across all care domains

Focus group comments on how the factor relates to integrated care

1.1. The quality of life of end users will increase as needs in different domains are interlinked.
1.2. Involving all care domains delivers a more complete picture of one's health and wellbeing.
1.3. The solution must approach a current uncovered need of end-users.
1.4. Solutions should be able to reflect the needs of end-users and adapt themselves as those needs change.
1.5. Good communication between areas, beneficiary groups and developers
1.6. The users must be involved in decision making
1.7. Consultations with end users are essential as well as others involved (interpreters, formal and, informal caregivers, family members etc.) — LOOK AT THE BIGGER PICTURE

Conditions required for factor to succeed identified by the focus group

5.1. Care providers need to have sufficient capacity to engage with care receivers, and to accommodate their needs
5.2. Contact between the care silos is established
5.3. Service users grant access to all care domains
5.4. Policy is fostering integrated care approaches
5.5. Health literacy is key to enable the right framing of one's needs and interests in integrated care
5.6. The existence of a multidisciplinary team in many of the facilities it`s important for the perception of outcomes provided by the intervention with a specific digital solution
5.7. A process exists that allows feedback from beneficiaries to be communicated to care givers
5.8. Beneficiaries need to know how to voice their needs and interests
5.9. They also need to know what their needs are, and that they are allowed/ encouraged to voice them
5.10. Beneficiaries and other relevant actors must have a platform/channel to voice needs and interests and exchange views and participate in decision making
5.11 The solution is non-discriminatory.
5.12. There is transparency in why certain solutions are adopted/implemented

The solution design should be functional from the perspective of the end-user

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Focus group comments on how the factor relates to integrated care

2.1. An intuitive solution design will reduce onboarding barriers
2.2. Consultations with end users and representative organisations
2.3. Intuitive and user friendly. Accessibility, universal design, etc. should be taken into consideration
2.4. Is very important because for people with lower digital literacy this could be an issue
2.5. A user-friendly solution would have higher acceptance.
2.6. People are less likely to use devices or engage in processes if they are too cumbersome
2.7. Functionality increases user engagement leading to better communication between system and users across domains.
2.8. Users will need to want and be able to engage with the solutions provided
2.9. Comply with the functionalities proposed by the users
2.10 It is important that solutions provide the functions they have committed to to ensure the trustworthiness that end-users want.
2.11 Solutions should address the functions on a personalised level, delivering the required service as requested.
2.12 Solution design should be inclusive and non-discriminatory.

Conditions required for factor to succeed identified by the focus group

8.1. The costs of the solution should be covered so that users have access.
8.2. Stakeholders engage with it, any issues with functionality can be identified and addressed.
8.3. There is sufficient capacity within the system to provide support to users.
8.4. End users have been involved in the design process.
8.5. Co-design taking into account users' needs.
8.6. Users' adherence level is high
8.7. The solution is easy to use and intuitive.
8.8. Usability and UX tests have been conducted
8.9. Accessibility, universal design and other principles should be taken into account
8.10 Personalised solutions delivering the required functions in an understandable and actionable format.

The solution will impact on healthier lifestyles

Focus group comments on how the factor relates to integrated care

3.1. Solutions should include informational content to generate health literacy.
3.2. Users who can access information about the benefits of their health interventions more likely to foster healthier habits in other areas.

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3.3. Solutions should address preventative measures for improved care and healthier lifestyles.
3.4. Solutions should be a tool or a guide to follow treatments or stick to healthier habits.
3.5. Healthier lifestyles for care receiver and care giver.
3.6. Healthier lifestyles require multi-faceted approach through many domains of integrated care.
3.7. Prevention is better than cure and will lower the impact on the demand for care.
3.8. Linking different professionals makes it easier to advice people on different aspects of their lifestyle.
3.9. The role of technology in prevention will perhaps be more important for active ageing. When there is already a diagnosed disease adherence to technology may be more limited for both care-recipient and caregivers.
3.10. A solution that fosters healthier lifestyles will relieve pressure on hospitals thereby encouraging private, public and political support for such integrated care programmes.

Conditions required for factor to succeed identified by the focus group

7.1. Solution gives service users more ownership of their health which can motivate them to improve their health in multiple areas
7.2. The system needs to be willing to adapt to the effects of the solution e.g., availability of ancillary services
7.3. Acceptance and overall use (between all stakeholders). e.g., presription of digital solution by gp
7.4. The solution motivates users to have a healthier routine
7.5. Tertiary prevention plans plans should be in place
7.6. Healthy lifestyles are part of the cultural values of a nation
7.7. Indicators to measure improvement must be in place, as well as a clear understanding on what is means to have a healthy lifestyle
7.8. The solution should keep track of user adherence and satisfaction with integrated care plan.
7.9. The preventative dimension is important but lacks the sense of need.

The solution should increase the efficiency in care

Focus group comments on how the factor relates to integrated care

4.1. Care providers can better coordinate care plans with the use of technology
4.2. The training in the use of the solutions is paramount not to overload the tasks of caregivers and care professionals.
4.3. Technology could facilitate communication to coordinate care plans without the need to be in the same physical space
4.4. The solution enables a more dynamic communication among care providers, health professionals, patients...etc

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4.5. Integrated care will lead to higher quality of life which will delay the need of institutionalisation
4.6. Improved access to care
4.7. Solutions should be able to record users' feelings and opinions about them (reviews)
4.8. Solutions should demonstrate their effectiveness (in terms of money savings, time, quality of care, etc) to be included in the overall structure of the organisation delivering care.
4.9. It is important for solutions to display the information that users can understand and want to receive. Too much information or non-contextualised one may cause unnecessary distress.
4.10 The end-user should be allowed to understand at his/her own pace the relevance of using the solution to easily fulfil their care tasks.

Conditions required for factor to succeed identified by the focus group

6.1. Understanding of what efficiency means or is, must be `pre-established'
6.2. The solution improves quality of life of users.
6.3. Indicators to measure efficiency are clear.
6.4. The digital solution could lead to efficiency but need to be integrated with the tasks for instance of the care-providers.
6.5. The solution is cost efficient.
6.6. It is important to identify relevant KPIs to ensure the correct measurement of efficiency.
6.7. There should be efficiency metrics to support the identification of the delta.
6.8. Infrastructure needs to be in place, e.g., fast broadband.
6.9. Saves time for clinicians, saves time for service user and results in improved measurable health outcomes.
6.10. Quality of life is a value that policy makers are willing to consider as part of a model.

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Annex 3 List of impacting factors

What follows is a list of factors that have been identified during the implementation of the various activities under T3.2. as being relevant for the successful adoption of person-centred technology-based solutions in integrated care programmes and services. Adoption can lead to upscaling in case the solution proves to be valid, or transfer to other contexts in case the solution is considered valid also by others.

The factors are divided according to
- the different stages of solution adoption: conceptualisation, contextualisation, implementation, and evaluation.
-the different domains that are particularly relevant to consider in a certain stage.

All factors are relevant to consider in case of person-centred technology adoption by a care providing organisation, some are particularly relevant to consider in case upscaling or transfer of a solution to other contexts is the goal.

Definitions used

Service delivery models broadly define the way services are delivered.
Service flows describe in detail the various steps in the service delivery process.
Care pathways are a way of setting out a process of best practice to be followed in the treatment of a patient or client with a particular condition or with needs.
The **Concept solution**, for the scope of this tool, is the theoretical ideation of an improvement in integrated care delivery based on the adoption of person-centred technology.
The **Envisaged Solution**, for the scope of this tool, is a detailed plan of how the concept solution should look like following the process of a contextual analysis of feasibility and compatibility.

CONCEPTUALISATION	Particularly relevant in case of: Upscaling	Transfer
Target groups and their needs		
The beneficiary group is well defined (e.g., inclusion criteria and population size are clear)	x	x
The variety in apparently homogeneous groups is considered.		x
The representativeness of the sample of the beneficiary group is considered.		
Other beneficiary groups and stakeholders are identified.		
The needs and interests of the beneficiary groups are well defined across the care domains (health, social, education, etc.).		
There is a clear understanding of the beneficiaries´ environment		x
The beneficiaries self-identify themselves in the expected benefits that the solution might bring.		
The needs and interests of the other stakeholder groups are well defined.		
The interests of different stakeholders are well aligned.		
The relationships between the stake holding groups are well defined.		

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The relationship between the needs of the different stake holding groups are well defined.		

Policies		
Integrated care is part of wider policy frameworks (e.g., national or regional level).	x	x
Integrated care is part of sector specific policies (e.g., health, social, education, technology).		
Financial support for integrated care is made available by the public sector.		
Political support for integrated care is made explicit by administrators.	x	
Personal data protection, data harmonisation and interoperability is a policy priority.		
Standardisation is a policy priority.		
There are (international) policy models of reference in the specific area of intervention.		x

Values, vision, and goals		
The involvement of all relevant stakeholders is a priority.		
The goals of the technology enabled intervention are clearly defined.		
The goals of the technology adoption process are clearly defined.		
The concept solution is part of existing care pathways.		
The concept solution will change existing care pathways.		
The concept solution is person-centred.		
The concept solution makes connections between all relevant stakeholders.		
The concept solution will respond to well defined needs.		
The concept solution's expected benefits are clearly defined (e.g., prevention, effectiveness treatment, efficiency care provision, quality of life etc.).		
The concept solution enhances the role of the care receiver and his/her care network.		
The concept solution incorporates the beneficiaries´ perspective and expectations.		
The concept solution is as simple as possible.		
The concept solution can adapt to changing conditions (e.g., policy, needs, beneficiary groups, technology, etc.).		x
The concept solution does not entirely substitute human intervention.		
The concept solution will improve the quality of life of the beneficiaries.		
The concept solution provides health literacy information.		
The concept solution is functional to the care process.		x
The concept solution will make care delivery easier (e.g., remote areas).	x	
The concept solution will make care delivery faster.	x	
The concept solution will make care more efficient.	x	
The concept solution challenges existing roles and responsibilities.		x
The concept solution is scalable (e.g., increasing number of people using the solution).	x	
The concept solution is transferable (e.g., to other organisations, regions, target groups).	x	x
The concept solution is discussed and peer reviewed by different experts and stakeholders.		

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CONTEXTUALISATION	Particularly relevant in case of: Upscaling	Transfer
Service context		
Existing care pathways are designed to foster integrated care.		
Existing care pathways are well designed and formalised.		
The envisaged solution fits into one or more existing care pathways.		x
Existing care pathways will have to be modified to embed the envisaged solution.		x
The envisaged solution allows for designing new care pathways.		
The envisaged solution fits into an existing service delivery model.	x	
The envisaged solution fits into an existing service flow.		
The service flow that will adopt the solution is well designed and roles and responsibilities are clear.		
The service flow that will adopt the solution is straightforward.		
The envisaged solution promotes involvement of all parties and participation in decision making.		
The service flow that will adopt the solution will meet the expectations and needs of the beneficiaries.		
The envisaged solution enhances the role of the care receiver and his/her care network.		
The envisaged solution allows to collect data relevant to the service flow.		
The envisaged solution is sufficiently flexible to meet the needs of individual beneficiaries.		
The envisaged solution supports continuity in care.		
The envisaged solution has been presented to and discussed with all stakeholders.		
The envisaged solution fits in the organisational model of the responsible organisation.	x	x
The envisaged solution adapts to its effects, e.g., availability of ancillary service.		
Sufficient time has been taken to review the envisaged solution and to elaborate alternatives.	x	
The envisaged solution has been approved by the highest decision-making level.	x	
Health and social care system		
The envisaged solution is compatible with protocols and practices in the existing health and social care system.	x	x
The envisaged solution has the potential to improve treatment and care protocols and guidelines.		
The envisaged solution is considered desirable by all stakeholders.		
The envisaged solution connects different professional groups and settings.		
The impact on the number of additional staff needed to support the use of technology is analysed.	x	
The levels of health and digital literacy in the ecosystem are considered.		
The presence of multidisciplinary teams and approaches is considered.		
Economic		
The envisaged solution is considered worth the investment by all stakeholders.	x	

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Existing similar adoption processes have been identified and analysed.		
An economic impact analysis of the solution implementation is made.	x	x
A cost-benefit analysis of the implementation of the solution has been made.	x	
The "market"-size is clear and there is insight in the development of the demand.	x	
The market size justifies the expected investment.	x	
The business model (public and/or private funding) is clear.	x	
The presence and length of public funding is known.		
The different sources of funding for the solution implementation have been analysed.	x	
Ecosystem enlargement to increase the economic sustainability has been considered.		
Whether the solution will provide directly financial resources (e.g., create direct income through sales of services) has been assessed.		
Whether end users are willing to pay for the services received or not has been assessed.		
Whether insurance companies are willing to pay for the services or not has been assessed.		
Whether venture capital can be involved in the implementation of the solution has been assessed.		
The costs of involving external companies have been budgeted.		
The costs of procurement, deployment, maintenance, and user support have been budgeted.		
The costs for customisation is taken into account.		x
Sufficient time has been allocated for the implementation process.		
The impact of the size of the implementation programme on the economy of scale has been considered.		
Whether the solution implementation will result in cost savings on the long term is considered.		
Whether there is experience with the technology in similar contexts and evidence of its effectiveness has been assessed.		
Whether the solution implementation will lead to an increase in the efficiency of care delivery has been considered.		
Whether the solution will make the care pathway more effective but maybe also more expensive has been considered.		
Whether the solution will be scalable and transferable to other sectors or regions has been considered.	x	
Whether additional income can be expected from selling of knowhow, software, services has been considered.		

IMPLEMENTATION	Particularly relevant in case of: Upscaling	Transfer
Implementation process management		
The solution is open and expandable.	x	x
The solution will be piloted before full deployment.		x
In case pilots are successful the service can be deployed without interruption.		x
Monitoring and evaluation tools are in place.		
A quality improvement strategy and tools are developed and in place.		

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Technical problem shooting is guaranteed for as long as needed.		
Communication about the implementation process is provided.		x
The organisation is open to innovation.		
All relevant expertise in the organisation is activated.		
The management is committed to the implementation.	x	
The effort related to the deployment "on site" is well understood.	x	x
Time needed for the personalisation of devices and wider solutions is considered.		
Training for users and staff is appropriate, sufficient, and continuing.		
All stakeholders (incl. users and staff) are informed and "on board".		
Early adopters and innovators in the organisation are identified and recognised.		
All processes are discussed, well detailed and described.	x	
Change management procedures are implemented.		
Data protection issues are sorted out.		x
Data sets are compatible across care contexts involved.		
Providers are screened, contracted, and paid.		
Sufficient time is allocated for deployment.	x	
There is an emergency scenario in case of unpredictable events.		

Technology related factors

Solutions areas much as possible based on state of the art and mainstream technology.		
The lifecycle of the chosen technologies is taken into account.		
Interfaces are intuitive and easy to use.	x	
Technologies and services are procured locally.		
Technologies are compatible with the different environments of the service users.		
Technologies are safe and secure.		
Solutions are interoperable with other technologies.		
Solutions are scalable to other sectors.	x	
Technologies are already in use elsewhere.		x
Technologies are as low cost as possible.		
Connectivity is assured.		

Human factors		
Early involvement is practiced.		
Attitude to innovation is stimulated.		
Willingness to use is ascertained.		
Price of the solution for end-users is reasonable.		
Expected benefits are clear.		
Expected outcomes are clear.		
Involvement of the wider organisation is incentivised.		
Resistance to change is addressed.		
Fear for change is addressed.		
Digital competences are developed.		
Informal care networks are supportive.		

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Informal care networks are supported.		
Confidence and trust among staff and beneficiaries have been strengthened through a personalised approach.		
Early adopters or positive role models are identified.		
Permanent support is available on an “as-needs” basis.		
Solution design		
The solution design is functional from the end-user perspective.		
Solution is developed and further improved with the users.		
Data readings are in different formats and interoperable with existing health records and practices.		x
Data are easy to read for users.		
The solution displays the information in a way that users can understand and want to receive.		
Solution is interoperable and scalable to other sectors.	x	x
Data management procedures and authorisations are in place.		x
Access to the internet is straightforward and easy.		
Opt-out-options are available.		
Remote control of the user-end is enabled.		
The solution is highly customisable (e.g., individual care plans).		x
The impact of the data on the care process is understood.		
The solution is aesthetically attractive.		
The solution displays the information in a way that users can understand and want to receive.		

Communication		
Communication and dissemination activities targeting all stake holding organisations are developed.	x	
Benefits of integrated care are explained to all stakeholders.	x	
Information and promotional activities for the wider population are developed.	x	

EVALUATION	Particularly relevant in case of: Upscaling	Transfer
Outcomes		
Patient (health) data are available and can be measured over a longer period.		
Data on access to health services (GP, Hospitals) can be collected.	x	
Patient data regarding adherence to treatment/medication can be collected.		
Data about patient satisfaction can be collected.		x
Patient satisfaction can be measured in different ways.		
Tools to measure return on investment are in place.	x	x
Performance indicators relevant to the health and social care system (e.g., waiting times, travel times and cost) can be measured	x	
Whether the outcomes are a win-win situation for all parties can be established.		x

Impact		

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Continuity in care can be better guaranteed.		
Care systems can be modified and further decentralised.		
A positive impact on healthier lifestyle development can be expected.		
An increasing number of people that start to monitor their condition can be expected.		
The impact on the demand for health care can be assessed.	x	
The impact on the overall wellbeing of the population can be assessed.		
The impact on the digital skills of users can be assessed.		
It will be easier to access health information.		
The size of the target group could increase.	x	
The solution can be scaled up or transferred to other groups or sectors.	x	
The organisation can develop in new directions.	x	x
There will be an impact on health protocols and additional care pathways development.		
More information on needs and use of primary care will be available.		
New standards could be developed or existing standards improved.		x

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Annex 4 Self-assessment tools

Stage	Self-assessment scale				
Conceptualisation	**Factors were:**				**Comments**
	Fully considered	Partially considered	Not considered	Irrelevant	

Contextualisation	**Factors were:**				**Comments**
	Fully analysed	Partially analysed	Not analysed	Irrelevant	

Implementation	**Factors are:**				**Comments**
	Fully managed	Partially managed	Not managed	Irrelevant	

Evaluation	**Factors were:**				**Comments**
	Fully assessed	Partially assessed	Not assessed	Irrelevant	

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CONCEPTUALISATION

Target groups and their needs	Particularly relevant for:		Factors were:				
	Upscaling	Transfer	Fully considered	Partially considered	Not considered	Irrelevant	Comments
The beneficiary group is well defined (e.g., inclusion criteria and population size are clear)	x	x					
The variety in apparently homogeneous groups is considered.		x					
The representativeness of the sample of the beneficiary group is considered.							
Other beneficiary groups and stakeholders are identified.							
The needs and interests of the beneficiary groups are well defined across the care domains (health, social, education, etc.).							
There is a clear understanding of the beneficiaries´ environment		x					
The beneficiaries self-identify themselves in the expected benefits that the solution might bring.							
The needs and interests of the other stakeholder groups are well defined.							
The interests of different stakeholders are well aligned.							
The relationships between the stake holding groups are well defined.							

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The relationship between the needs of the different stake holding groups are well defined.							

Policies	Particularly relevant for:		Factors were:				
	Upscaling	Transfer	Fully considered	Partially considered	Not considered	Irrelevant	Comments
Integrated care is part of wider policy frameworks (e.g., national or regional level).	x	x					
Integrated care is part of sector specific policies (e.g., health, social, education, technology).							
Financial support for integrated care is made available by the public sector.							
Political support for integrated care is made explicit by administrators.	x						
Personal data protection, data harmonisation and interoperability is a policy priority.							
Standardisation is a policy priority.							
There are (international) policy models of reference in the specific area of intervention.		x					

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Values, vision, and goals	Particularly relevant for:		Factors were:				
	Upscaling	Transfer	Fully considered	Partially considered	Not considered	Irrelevant	Comments
The involvement of all relevant stakeholders is a priority.							
The goals of the technology enabled intervention are clearly defined.							
The goals of the technology adoption process are clearly defined.							
The concept solution is part of existing care pathways.							
The concept solution will change existing care pathways.							
The concept solution is person-centred.							
The concept solution makes connections between all relevant stakeholders.							
The concept solution will respond to well defined needs.							
The concept solution's expected benefits are clearly defined (e.g., prevention, effectiveness treatment, efficiency care provision, quality of life etc.).							
The concept solution enhances the role of the care receiver and his/her care network.							
The concept solution incorporates the beneficiaries´ perspective and expectations.							
The concept solution is as simple as possible.							

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The concept solution can adapt to changing conditions (e.g., policy, needs, beneficiary groups, technology, etc.).		x					
The concept solution does not entirely substitute human intervention.							
The concept solution will improve the quality of life of the beneficiaries.							
The concept solution provides health literacy information.							
The concept solution is functional to the care process.		x					
The concept solution will make care delivery easier (e.g., remote areas).	x						
The concept solution will make care delivery faster.	x						
The concept solution will make care more efficient.	x						
The concept solution challenges existing roles and responsibilities.		x					
The concept solution is scalable (e.g., increasing number of people using the solution).	x						
The concept solution is transferable (e.g., to other organisations, regions, target groups).	x	x					
The concept solution was discussed, and peer reviewed by different experts and stakeholders.							

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CONTEXTUALISATION

Service context	Particularly relevant for:		Factors were:				
	Upscaling	Transfer	Fully analysed	Partially analysed	Not analysed	Irrelevant	Comments
Existing care pathways are designed to foster integrated care.							
Existing care pathways are well designed and formalised.							
The envisaged solution fits into one or more existing care pathways.		x					
Existing care pathways will have to be modified to embed the envisaged solution.		x					
The envisaged solution allows for designing new care pathways.							
The envisaged solution fits into an existing service delivery model.	x						
The envisaged solution fits into an existing service flow.							
The service flow that will adopt the solution is well designed and roles and responsibilities are clear.							
The service flow that will adopt the solution is straightforward.							
The envisaged solution promotes involvement of all parties and participation in decision making.							
The service flow that will adopt the solution will meet the expectations and needs of the beneficiaries.							

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The envisaged solution enhances the role of the care receiver and his/her care network.							
The envisaged solution allows to collect data relevant to the service flow.							
The envisaged solution is sufficiently flexible to meet the needs of individual beneficiaries.							
The envisaged solution supports continuity in care.							
The envisaged solution has been presented to and discussed with all stakeholders.							
The envisaged solution fits in the organisational model of the responsible organisation.	x	x					
The envisaged solution adapts to its effects, e.g., availability of ancillary service.							
Sufficient time has been taken to review the envisaged solution and to elaborate alternatives.	x						
The envisaged solution has been approved by the highest decision-making level.	x						

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Health and social care system	Particularly relevant for:		Factors were:				
	Upscaling	Transfer	Fully analysed	Partially analysed	Not analysed	Irrelevant	Comments
The envisaged solution is compatible with protocols and practices in the existing health and social care system.	x	x					
The envisaged solution has the potential to improve treatment and care protocols and guidelines.							
The envisaged solution is considered desirable by all stakeholders.							
The envisaged solution connects different professional groups and settings.							
The impact on the number of additional staff needed to support the use of technology is analysed.	x						
The levels of health and digital literacy in the ecosystem are considered.							
The presence of multidisciplinary teams and approaches is considered.							

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Economic	Particularly relevant for:		Factors were:				
	Upscaling	Transfer	Fully analysed	Partially analysed	Not analysed	Irrelevant	Comments
The envisaged solution is considered worth the investment by all stakeholders.	x						
Existing similar adoption processes have been identified and analysed.							
An economic impact analysis of the solution implementation is made.	x	x					
A cost-benefit analysis of the implementation of the solution has been made.	x						
The "market"-size is clear and there is insight in the development of the demand.	x						
The market size justifies the expected investment.	x						
The business model (public and/or private funding) is clear.	x						
The presence and length of public funding is known.							
The different sources of funding for the solution implementation have been analysed.	x						
Ecosystem enlargement to increase the economic sustainability has been considered.							
Whether the solution will provide directly financial resources (e.g., create direct income through sales of services) has been assessed.							

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Whether end users are willing to pay for the services received or not has been assessed.							
Whether insurance companies are willing to pay for the services or not has been assessed.							
Whether venture capital can be involved in the implementation of the solution has been assessed.							
The costs of involving external companies have been budgeted.							
The costs of procurement, deployment, maintenance, and user support have been budgeted.							
The costs for customisation is taken into account.		x					
Sufficient time has been allocated for the implementation process.							
The impact of the size of the implementation programme on the economy of scale has been considered.							
Whether the solution implementation will result in cost savings on the long term is considered.							
Whether there is experience with the technology in similar contexts and evidence of its effectiveness has been assessed.							
Whether the solution implementation will lead to an increase in the efficiency of care delivery has been considered.							
Whether the solution will make the care pathway more effective but maybe also more expensive has been considered.							

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Whether the solution will be scalable and transferable to other sectors or regions has been considered.	x						
Whether additional income can be expected from selling of knowhow, software, services has been considered.							

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IMPLEMENTATION

Implementation process management	Particularly relevant for:		Factors are:				
	Upscaling	Transfer	Fully managed	Partially managed	Not managed	Irrelevant	Comments
The solution is open and expandable.	x	x					
The solution will be piloted before full deployment.		x					
In case pilots are successful the service can be deployed without interruption.		x					
Monitoring and evaluation tools are in place.							
A quality improvement strategy and tools are developed and in place.							
Technical problem shooting is guaranteed for as long as needed.							
Communication about the implementation process is provided.		x					
The organisation is open to innovation.							
All relevant expertise in the organisation is activated.							
The management is committed to the implementation.	x						
The effort related to the deployment "on site" is well understood.	x	x					
Time needed for the personalisation of devices and wider solutions is considered.							
Training for users and staff is appropriate, sufficient, and continuing.							
All stakeholders (incl. users and staff) are informed and "on board".							

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Early adopters and innovators in the organisation are identified and recognised.							
All processes are discussed, well detailed and described.	x						
Change management procedures are implemented.							
Data protection issues are sorted out.		x					
Data sets are compatible across care contexts involved.							
Providers are screened, contracted, and paid.							
Sufficient time is allocated for deployment.	x						
There is an emergency scenario in case of unpredictable events.							

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Technology related factors	Particularly relevant for: Upscaling	Transfer	Factors are: Fully managed	Partially managed	Not managed	Irrelevant	Comments
Solutions areas much as possible based on state of the art and mainstream technology.							
The lifecycle of the chosen technologies is taken into account.							
Interfaces are intuitive and easy to use.	x						
Technologies and services are procured locally.							
Technologies are compatible with the different environments of the service users.							
Technologies are safe and secure.							
Solutions are interoperable with other technologies.							
Solutions are scalable to other sectors.	x						
Technologies are already in use elsewhere.		x					
Technologies are as low cost as possible.							
Connectivity is assured.							

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Human factors	Particularly relevant for:		Factors are:				
	Upscaling	Transfer	Fully managed	Partially managed	Not managed	Irrelevant	Comments
Early involvement is practiced.							
Attitude to innovation is stimulated.							
Willingness to use is ascertained.							
Price of the solution for end-users is reasonable.							
Expected benefits are clear.							
Expected outcomes are clear.							
Involvement of the wider organisation is incentivised.							
Resistance to change is addressed.							
Fear for change is addressed.							
Digital competences are developed.							
Informal care networks are supportive.							
Informal care networks are supported.							
Confidence and trust among staff and beneficiaries have been strengthened through a personalised approach.							
Early adopters or positive role models are identified.							
Permanent support is available on an “as-needs” basis.							

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Solution design	Particularly relevant for:		Factors are:				
	Upscaling	Transfer	Fully managed	Partially managed	Not managed	Irrelevant	Comments
The solution design is functional from the end-user perspective.							
Solution is developed and further improved with the users.							
Data readings are in different formats and interoperable with existing health records and practices.		x					
Data are easy to read for users.							
The solution displays the information in a way that users can understand and want to receive.							
Solution is interoperable and scalable to other sectors.	x	x					
Data management procedures and authorisations are in place.		x					
Access to the internet is straightforward and easy.							
Opt-out-options are available.							
Remote control of the user-end is enabled.							
The solution is highly customisable (e.g., individual care plans).		x					
The impact of the data on the care process is understood.							
The solution is aesthetically attractive.							
The solution displays the information in a way that users can understand and want to receive.							

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Communication	Particularly relevant for:		Factors are:				
	Upscaling	Transfer	Fully managed	Partially managed	Not managed	Irrelevant	Comments
Communication and dissemination activities targeting all stake holding organisations are developed.	x						
Benefits of integrated care are explained to all stakeholders.	x						
Information and promotional activities for the wider population are developed.	x						

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EVALUATION

Outcomes	Particularly relevant for		Factors were:				
	Upscaling	Transfer	Fully assessed	Partially assessed	Not assessed	Irrelevant	Comments
Patient (health) data are available and can be measured over a longer period.							
Data on access to health services (GP, Hospitals) can be collected.	x						
Patient data regarding adherence to treatment/medication can be collected.							
Data about patient satisfaction can be collected.		x					
Patient satisfaction can be measured in different ways.							
Tools to measure return on investment are in place.	x	x					
Performance indicators relevant to the health and social care system (e.g., waiting times, travel times and cost) can be measured	x						
Whether the outcomes are a win-win situation for all parties can be established.		x					

Impact	Particularly relevant for		Factors were:				
	Upscaling	Transfer	Fully assessed	Partially assessed	Not assessed	Irrelevant	Comments
Continuity in care can be better guaranteed.							
Care systems can be modified and further decentralised.							

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A positive impact on healthier lifestyle development can be expected.							
An increasing number of people that start to monitor their condition can be expected.							
The impact on the demand for health care can be assessed.	x						
The impact on the overall wellbeing of the population can be assessed.							
The impact on the digital skills of users can be assessed.							
It will be easier to access health information.							
The size of the target group could increase.	x						
The solution can be scaled up or transferred to other groups or sectors.	x						
The organisation can develop in new directions.	x	x					
There will be an impact on health protocols and additional care pathways development.							
More information on needs and use of primary care will be available.							
New standards could be developed or existing standards improved.		x					

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