

# Digital Health Uptake

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## D4.1 Tools to support digital health solutions implementation and uptake v1

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**Abstract**

This deliverable describes the framework to classify methodologies and tools to support the implementation and uptake of digital health solutions and illustrate each category by providing a selection of useful methods and tools.

**Statement of originality**

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both. Views and opinions expressed are those of the author(s) only and do not necessarily reflect those of the European Union or of DG CONNECT. Neither the European Union nor the granting authority can be held responsible for them.

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## List of Abbreviations

AMAM	Analytics Maturity Adoption Model
CCMM	Continuity of Care Maturity Model
DHI	Digital Health Index
DHU	DigitalHealthUptake
DIAM	Digital Imaging Adoption Model
EC	European Commission
EMRAM	Electronic Medical Record Adoption Model
EU	European Union
INFRAM	Infrastructure Adoption Model
MAST	Model for Assessment of Telemedicine
NA	Not applicable
O-EMRAM	Outpatient Electronic Medical Record Adoption Model
SME	Small and Medium Enterprise
TRL	Technology Readiness Level
UK	United Kingdom
WP	Work Package

## EXECUTIVE SUMMARY

This deliverable “Tools to support digital health solutions implementation and uptake” is the first version of the report that aims to identify existing methods and tools proven helpful to implement and scale-up digital health. This exercise is part of the DigitalHealthUptake (DHU) project and sets the framework for the further exploitation of methods and tools that will be collected through the DHU Radar and discussed in different knowledge communities.

A framing exercise is presented considering three dimensions that include digital health solutions, platforms and integration, the implementation process and the digital health ecosystem. Our breadth of coverage is to identify, categorise and describe methods and tools that facilitate uptake of the innovation by supporting the adoption needs of different stakeholders such as training, as well as instruments that measure the extent of uptake or measure overall digital maturity.

The collection and mapping of methods and tools is conducted in two phases. In the first phase, interviews with project partners helped to identify relevant methods and tools that support implementation and scale-up. Inclusion and exclusion criteria were defined to guide the process and avoid tools difficult to transfer or deploy.

As a result of the collection first phase, 18 methods and tools have been identified covering five out of the seven categories defined in the framework. For each method, a description fiche is provided that contains evidence of successful implementation, especially in the digital health field. Most are practical tools and maturity, and readiness levels is the category with more examples, followed by design of solutions and value assessment tools.

The collection second phase will consist of exploiting the DHU Radar and the expertise of the knowledge communities organised by the project. Some of these tools will be object of specific technical support to digital health implementers organised around DHU Twinning.

# 1 Background

DigitalHealthUptake (DHU) is a EU-funded project under the Digital Europe Programme whose overarching goal is to facilitate the alignment, strengthening and coordination of policies, strategies, instruments and activities regarding the uptake of digital health solutions and services in Europe. This main aim is broken down into three operational objectives:

- ▶ To monitor and analyse the uptake and use of digital health and care solutions in regions, Member States and associated countries.
- ▶ To create an environment of cooperation and active stakeholder contribution which facilitates regular exchanges between the demand and supply sides to foster cross-border scaling up of digital health solutions and services.
- ▶ To strengthen capacity building for implementation/ uptake by identifying and qualifying relevant tools and methods that provide guidance, stimulating mutual learning and transferring of innovative practices to foster adoption, upscaling, large-scale deployment.

These objectives are developed by the three key work packages: the Radar (WP2), the Knowledge Community (WP3) and the Accelerator (WP4). The following visual describes the actions planned per each work stream.

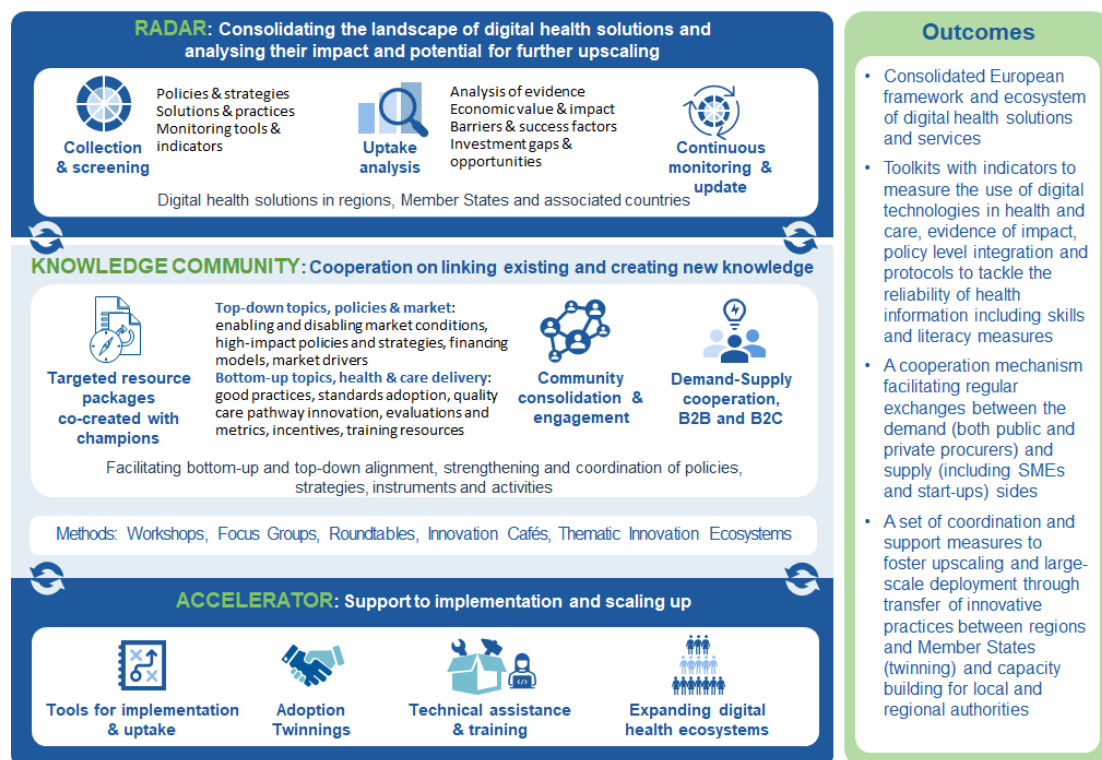


Figure 1. Digital Health Uptake in a nutshell

In response to the third objective, task 4.1 identifies relevant tools and methods that qualify as suitable to support the implementation and uptake of digital health in Europe, drawing on the results that will be provided by the DHU Radar. This is a foundational step for the planning of relevant support services for the supply and demand side. Specific trainings of these methods and tools will be deployed in the second half of the project as part of the technical support to digital health implementers.

## 2 Goals and methodology

This chapter lists the goals of this document and describes the methodology followed to achieve these goals in the short term (first version) and long term (second version) of this report.

### 2.1 Goals

This report aims to achieve three goals:

1. Identify existing methods and tools that have been demonstrated as capable to support the uptake and scale-up of digital health solutions both from the demand and the supply side.
2. Develop a framework to categorise and characterise the identified methods and tools.
3. Map out against this framework methods and tools currently available for different purposes such as to assist the practical implementation and scale-up of innovative digital health solutions.

### 2.2 Methodology

To achieve the goals of identification, framing and mapping of methods and tools for the uptake and scale-up of digital health solutions, a two-phase process was established.

The first phase tapped on the knowledge of project partners in the field of digital health. Through individual interviews, a first list of methods and tools were identified and described. This compendium served to the framing exercise and is documented in this first version of the deliverable 4.1.

A second phase is planned to exploit the collection of methods and tools through the DHU Radar<sup>1</sup>. The Radar was launched in April 2023<sup>2</sup> and is a unique platform that enables the discovery and learning about digital health innovations in Europe, their adoption and success. It publishes innovations and experiences, including methods and tools to support the implementation and uptake of digital health solutions. The Radar is implemented through an online survey which contains one category to report “Supporting tool and methodology for upscaling digital health solutions or services (e.g. management tool/impact assessment tool and methodology/etc.)”<sup>3</sup>. It is foreseen that the Radar will provide a number of methods and tools that will be further classified in the framework developed in this version. The results of this classification will be available in the second version of D4.1 expected by November 2024.

#### Inclusion and exclusion criteria

Not all methods and tools proposed in the first iteration were included. A set of inclusion and exclusion criteria were defined to ensure consistency and comparability.

To be included, the methodology or tool needed first to have been applied in the digital health sector. Second, it needed to be materialised in a document or application in order to facilitate knowledge transfer and capacity building. And third, it must be in the public domain even if it is protected by intellectual property rights.

Two exclusion criteria were defined. First, it was considered that methods and tools used for the development of the software component of digital health solutions (e.g., agile methodologies) were excluded as the focus of the collection was on implementation and scale-up, not just development. Second, training programmes that were not focused on methodologies and tools were discarded.

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<sup>1</sup> DHU Radar: <https://digitalhealthuptake.eu/radar/>

<sup>2</sup> Launch of the DHU Radar: <https://twitter.com/DHUuptake/status/1643525714036027392>

<sup>3</sup> DHU Radar Repository: <https://digitalhealthuptake.eu/radar-repository/>



### 3 Digital Health Uptake Framework

In this chapter we describe the framework developed to categorise the different methodologies and tools identified through interviews and that aim to support the implementation and uptake of digital health solutions.

#### 3.1 Dimensions of analysis

In the process of categorising tools to support the implementation and uptake of digital health solutions, three dimensions of analysis have been used as illustrated in the following figure. They encompass the dimension of the object of study (digital health solutions, platforms and integrations), the process of deployment (implementation process) and the environment of adoption (the digital health ecosystem).

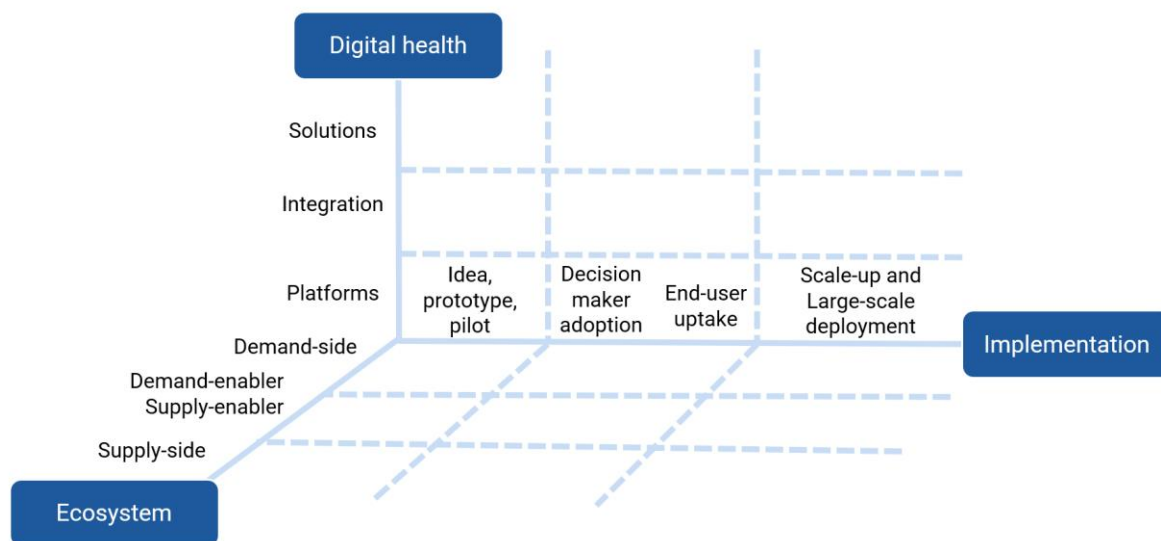


Figure 2. Digital Health Uptake dimensions

##### Dimension 1. Digital health

For the purpose of this report, we are differentiating three objects under this dimension: solutions, platforms, and their integration.

- **Digital health solutions** are systems that support various aspects of healthcare delivery, management, and patient engagement. They connect directly or indirectly, synchronously or asynchronously, healthcare professionals and/or patients. These include solutions such as electronic health records, telehealth applications, mobile health, remote patient monitoring and clinical decision-support systems.
- **Digital health platforms** are systems that leverage technology and health data to provide various healthcare services, resources, and tools to individuals, healthcare providers, and other stakeholders in the healthcare ecosystem. They are open platforms conceived for the development of innovative solutions or to connect digital health solutions.
- **Digital health integration** is the process of incorporating digital health solutions, technologies, and data into existing healthcare systems, workflows, and processes.

## Dimension 2. Implementation process

Although the focus of Digital Health Uptake is from the adoption and uptake phases, the implementation process also encompasses the ideation process. In the following table, the steps in the process from idea to large-scale deployment are defined. It is worth to signal the difference between end-user uptake and decision-maker adoption, distinguishing the top-down from the bottom-up process of adoption.

**Table 2.** Description of implementation phases

Phase	Description
<b>Idea</b>	This phase of the development of a digital health solution or service is the first one and includes the formulation of an idea. With reference to the Technology Readiness Level (TRL) model, the ideation phase covers TRL level 1 “Basic principles observed” and TRL 2 “Technology concept formulated”. Initial step of defining the problem to be solved and shaping the solution.
<b>Prototype</b>	It consists of transforming the idea or concept into a practical application ready to be tested in a controlled environment. With reference to the Technology Readiness Level (TRL) model, the prototype covers TRL 3 “Experimental proof of concept” and TRL 4 “Technology validated in lab”.
<b>Pilot</b>	A pilot typically involves rolling out the digital health solution to a small test group to get feedback and smoke-test technical capabilities in real-world scenarios. With reference to the Technology Readiness Level (TRL) model, this step corresponds to TRL 5 “Technology validated in relevant environment” and TRL 6 “Technology demonstrated in relevant environment”
<b>Decision maker adoption</b>	Adoption is understood as encompassing the well-designed integration of a digital health practice into an organisation or a regional/national health system as “routine practice” (e.g., integration into clinical workflows). This requires an organisational or system level approval by decision-makers and is influenced by various dimensions such as the regulatory, political, or sociocultural environment, organisational and staff capacities, readiness for change, value propositions, etc. Hence, it excludes short-term adoption of a practice by individual adopters. With reference to the Technology Readiness Level (TRL) model, this step corresponds to TRL 7 “System prototype demonstrated in operational environment”, TRL 8 “System completed and qualified” and TRL 9, “Actual system proven in operational environment”.
<b>End-user uptake</b>	In the context of DHU, uptake refers to the process of adoption and real-life implementation of a digital health practice across a country, different regions or, functionally, by different sectors of care. Uptake of a digital health practice follows a process chain of equally important steps, which, depending on the readiness, can concern knowledge exchange and training of end-users up to partial or full adoption / integration of a solution or a service. Thus, uptake can be regarded successful when moving to the next step of the process chain, e.g., from training to service integration or routine operation with large-scale use of the practice.
<b>Scale-up</b>	WHO defines scale-up as “deliberate efforts to increase the impact of successfully tested health innovations so as to benefit more people and to foster policy and programme development on a lasting basis.” <sup>4</sup> In the DHU project, it refers to quantitative/horizontal scaling up in terms of extending the reach of a successful digital health practice through expansion and replication. This also requires tackling barriers to large scale implementation, such as stabilising a sustainable funding base for the digital health practice.
<b>Large-scale deployment</b>	It is the last phase of the implementation process and consists of expanding the digital health innovation across the entire organization or health system, making the solution available to all potential users.

<sup>4</sup> World Health Organization. (2016). Scaling up projects and initiatives for better health: from concepts to practice. Copenhagen: WHO Regional Office for Europe. [pdf] Available at: [https://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0004/318982/Scaling-up-reports-projects-concepts-practice.pdf](https://www.euro.who.int/__data/assets/pdf_file/0004/318982/Scaling-up-reports-projects-concepts-practice.pdf)

### Dimension 3. Digital health ecosystem

Under this dimension we differentiate four types of agents in the digital health ecosystem:

- Demand-side agents: healthcare organisations, providers and professionals, citizens, and patients.
- Supply-side: health technology developers (start-ups, SMEs, and large corporations).
- Demand-enabler: public purchasers of digital health services
- Supply-enabler: digital health innovation hubs that foster the creation and expansion of digital health companies, or standards development organisations.

## 3.2 Developing a framework of methods and tools for digital health implementation

The implementation process described above defines the scope for categorising methodologies and tools intended to support implementation and uptake of digital health solutions. Each identified method and tool have been conceived to be applied in a particular phase of the implementation process in support of different functions.

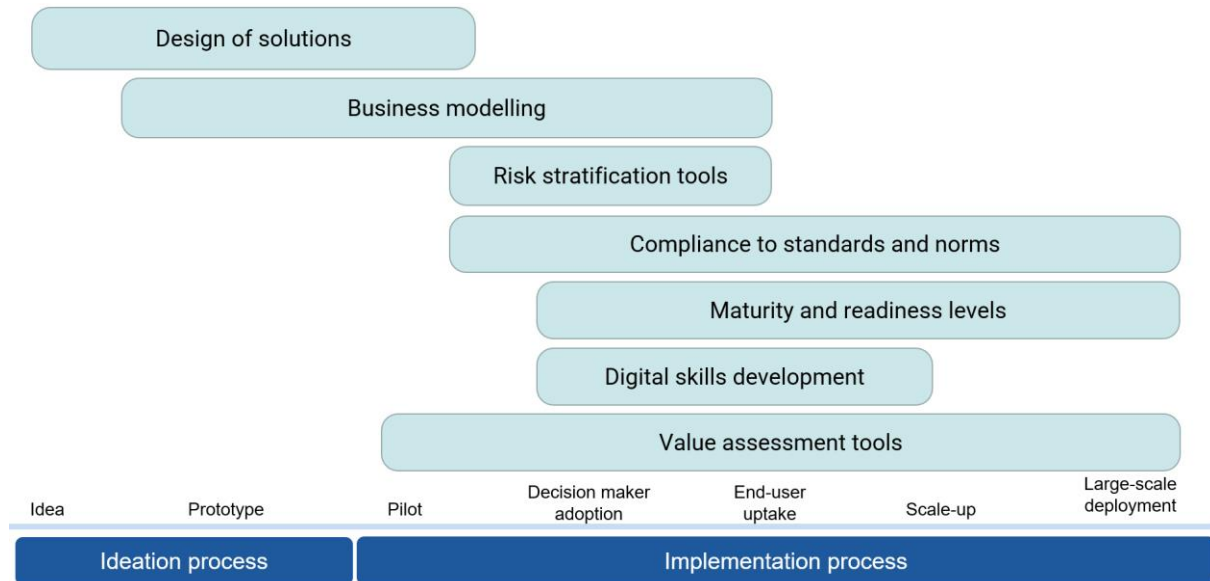
Based on the collected methodologies and tools, the following categories were identified and are described in the next table. They span from ideation to large-scale deployment and are illustrated in Figure 2 along the ideation and implementation phases.

Seven categories were identified: (1) Design of solutions; (2) Business modelling; (3) Risk stratification tools; (4) Compliance to standards and norms; (5) Maturity and readiness levels; (6) Digital skills development; and (7) Value assessment tools.

**Table 2.** Description of methods and tools categories

Category	Description
<b>Design of solutions</b>	Methodologies and tools used for developing the concept and prototype of a digital health solution taking into consideration end-users needs.
<b>Business modelling</b>	A business model describes how an organisation creates, delivers, and captures value, in economic, social, cultural or other contexts. Business modelling is the process of defining or modifying an existing business model.
<b>Risk stratification tools</b>	Risk stratification tools use objective and subjective data to assign risk levels to patients. Healthcare providers can systematically use patient risk stratification to make care management decisions, such as providing greater access and resources to patients in higher risk levels or deploy digital health solutions targeting a specific patient group.
<b>Compliance to standards and norms</b>	Methods and tools to assess and assure the level of conformity with international, European or national standards or regulations such as the Medical Device Regulation or the Artificial Intelligence Act. Risk assessment tools also comprise in this category.
<b>Maturity and readiness levels</b>	Maturity models and readiness levels are tools that organisations use to measure how well their business or project are in respect to a sorted gradient of maturity.
<b>Digital skills development</b>	Training programmes and tools to develop capacities to understand and use digital technologies and data.
<b>Value assessment tools</b>	Methodologies to evaluate and compare the costs and consequences of two or more alternatives of care. Consequences include measures of effectiveness, utility or benefit.

It is important to remark that the classification has avoided using the dimension of digital health to classify methods and tools and therefore, specific tools addressing a particular digital health technology (e.g., telemedicine) were classified according to the function in the implementation process.



**Figure 3.** Digital Health Uptake framework of methods and tools for digital health implementation

Following the exclusion criteria some proposed methods and tools were provisionally discarded such as software development methodologies (agile, scrum, kanban, etc.) or training programmes not supported by a methodology or tool (e.g., market access, alliances creation, support to ethical audits, etc.).

## 4 Profiling of tools

The first phase of collection of methods and tools was carried out through individual interviews with project partners. Through their contribution, 18 methods and tools classified in five of the seven defined categories were identified. They are listed and briefly described in this chapter classified by the framework categories.

For each method and tool selected, an information fiche is provided with the description of the purpose, sources for more information and access to the tool. Methods and tools are also classified by categories, type of digital health, implementation level and target user. Finally, evidence of successful implementation primarily based on peer-reviewed scientific publications has been provided. A full list of the results is provided in Annex 1.

This documentation forms the basis for the development of catalogues and use guides foreseen in the next version and informed by the stakeholder community.

### 4.1 Design of solutions

Three design methodologies are selected as example for the purpose of this deliverable that can support both supply and demand side in the initial steps of ideation and implementation. All have in common that the end-user is central in the design process.

#### 4.1.1 Design thinking

Name	Design thinking
Purpose:	Design thinking provides all professionals with a standardized innovation process to develop creative solutions to problems.
More information:	<a href="https://designthinking.ideo.com/">https://designthinking.ideo.com/</a>
Method or tool:	Methodology
Tool access:	N/A
Category:	Design of solutions
Applicable to:	Solutions, Platforms, Integration
Implementation level:	From idea to prototype. It can also be applied in further phases.
Target users:	Demand side (healthcare providers) Supply side (tech companies) Enabler side (payers, procurers)
Evidence of success:	Design thinking has been widely applied to design healthcare services. A systematic review <sup>5</sup> published in 2021 identified 32 research papers documenting the application of design thinking. Applied to digital health, a systematic scoping review explored the use of design thinking to develop mobile health interventions, identifying 75 papers. <sup>6</sup>

<sup>5</sup> Oliveira, M., Zancul, E. and Fleury, A.L., 2021. Design thinking as an approach for innovation in healthcare: systematic review and research avenues. *BMJ Innovations*, 7(2).

<sup>6</sup> Voorheis, P., Zhao, A., Kuluski, K., Pham, Q., Scott, T., Sztur, P., Khanna, N., Ibrahim, M. and Petch, J., 2022. Integrating behavioral science and design thinking to develop mobile health interventions: systematic scoping review. *JMIR mHealth and uHealth*, 10(3), p.e35799.

### 4.1.2 User-centred design

Name	User-centred design
Purpose:	User-Centred design aims to make products and services with a high usability, including how convenient they are in terms of its usage, manageability, effectiveness, and how well they are mapped to the user requirements.
More information:	<a href="https://uxmastery.com/resources/techniques/">https://uxmastery.com/resources/techniques/</a>
Method or tool:	Methodology
Tool access:	N/A
Category:	Design of solutions
Applicable to:	Solutions, Platforms
Implementation level:	From idea to prototype. It can also be applied in further phases.
Target users:	Demand side (healthcare providers) Supply side (tech companies)
Evidence of success:	User-centred design is used widely in the design of digital health solutions like mobile health <sup>7</sup> or eHealth services <sup>8</sup> .

### 4.1.3 Blueprint Personas

Name	Blueprint Personas
Purpose:	Twelve personas were developed in the Blueprint on Digital Transformation of Health and Care for the Ageing Society to assist in the design of health services, especially digital health services.
More information:	<a href="https://blueprint-personas.eu/">https://blueprint-personas.eu/</a>
Method or tool:	Tool
Tool access:	<a href="https://blueprint-personas.eu/resources/">https://blueprint-personas.eu/resources/</a>
Category:	Design of solutions
Applicable to:	Solutions, Platforms
Implementation level:	From idea to prototype. It can also be applied in further phases.
Target users:	Demand side (healthcare providers) Supply side (tech companies)
Evidence of success:	The Blueprint Personas has been used extensively to design digital health services in the context of research and innovation projects. <sup>9</sup>

<sup>7</sup> Farao, J., Malila, B., Conrad, N., Mutsvangwa, T., Rangaka, M.X. and Douglas, T.S., 2020. A user-centred design framework for mHealth. PLoS one, 15(8), p.e0237910.

<sup>8</sup> Blanes-Selva, V., Asensio-Cuesta, S., Doñate-Martínez, A., Pereira Mesquita, F. and García-Gómez, J.M., 2023. User-centred design of a clinical decision support system for palliative care: Insights from healthcare professionals. Digital Health, 9, p.20552076221150735.

<sup>9</sup> Vogt J. The European blueprint on digital transformation of health and care for the ageing society. International Journal of Integrated Care. 2021 Sep 1;21(S1).

## 4.2 Business modelling

Three business modelling tools are selected for the purpose of this deliverable, and they can be applied by all actors of the digital health ecosystem, specially in the implementation phases that range from prototype formulation to large-scale deployment.

### 4.2.1 Business model canvas

Name	Business Model Canvas
Purpose:	The Business Model Canvas is a tool to visualise all the building blocks to start a business, including customers, route to market, value proposition and finance.
More information:	<a href="https://www.strategyzer.com/canvas/business-model-canvas">https://www.strategyzer.com/canvas/business-model-canvas</a>
Method or tool:	Tool
Tool access:	Book: Business model generation: a handbook for visionaries, game changers, and challengers. <sup>10</sup> App: <a href="https://www.strategyzer.com/app">https://www.strategyzer.com/app</a>
Category:	Business modelling
Applicable to:	Solutions, Platforms, Integration
Implementation level:	From prototype to end-user uptake. It can also be applied to scale-up.
Target users:	Demand side (healthcare providers) Demand enabler (payers, procurers) Supply side (tech companies)
Evidence of success:	In the field of digital health, the Business Model Canvas has been used to design and define the value proposition of multiple solutions. Some examples are applied to mHealth standards <sup>11</sup> or digital health ecosystems <sup>12</sup> .

### 4.2.2 Platform design tool

Name	Platform design tool
Purpose:	To build multi-sided, transformative platform strategies to empower ecosystems in creating shared value.
More information:	<a href="https://www.boundaryless.io/">https://www.boundaryless.io/</a>
Method or tool:	Tool
Tool access:	<a href="https://www.boundaryless.io/pdt-toolkit/">https://www.boundaryless.io/pdt-toolkit/</a>
Category:	Business modelling
Applicable to:	Solutions, Platforms
Implementation level:	Scale-up, Large-scale deployment
Target users:	Demand side (healthcare providers) Demand enabler (payers, procurers)

<sup>10</sup> Osterwalder, A. and Pigneur, Y., 2010. Business model generation: a handbook for visionaries, game changers, and challengers (Vol. 1). John Wiley & Sons.

<sup>11</sup> Tagueo, V., Dantas, C.B.M.S., Chronaki, C., Lowe, C., Berler, A. and Porcu, F., 2020. Business model canvas for adoption of International Patient Summary standards in mHealth industry. Journal of Business Models, 8(3), pp.91-106.

<sup>12</sup> Marcos-Pablos, S., García-Holgado, A. and García-Peñalvo, F.J., 2019, October. Modelling the business structure of a digital health ecosystem. In Proceedings of the Seventh International Conference on Technological Ecosystems for Enhancing Multiculturality (pp. 838-846).

	Supply side (tech companies)
Evidence of success:	Adopted worldwide by global Fortune 500 leaders, leading institutions, startups, and scaleups.

### 4.2.3 Rulebook for a fair data economy

Name	Rulebook for a fair data economy
Purpose:	The rulebook offers instructions and templates to facilitate data network building.
More information:	<a href="https://www.sitra.fi/en/publications/rulebook-for-a-fair-data-economy/">https://www.sitra.fi/en/publications/rulebook-for-a-fair-data-economy/</a>
Method or tool:	Tool
Tool access:	<a href="https://www.sitra.fi/en/publications/rulebook-for-a-fair-data-economy/#publication-content">https://www.sitra.fi/en/publications/rulebook-for-a-fair-data-economy/#publication-content</a>
Category:	Business modelling
Applicable to:	Solutions, Platforms
Implementation level:	From prototype to large-scale deployment
Target users:	Demand side (healthcare providers) Demand enabler (payers, procurers) Supply side (tech companies)
Evidence of success:	A Finnish model for the secure and effective use of data: <a href="https://www.sitra.fi/en/publications/a-finnish-model-for-the-secure-and-effective-use-of-data/">https://www.sitra.fi/en/publications/a-finnish-model-for-the-secure-and-effective-use-of-data/</a>

## 4.3 Compliance to standards and norms

Tools selected under this category, in this version of the deliverable, represent the domain of mobile health solutions and different national/regional and private assessment frameworks. Other methodologies or tools exist or are under development that support compliance with recent digital health regulations such as checklist for the Medical Device Regulation, the Artificial Intelligence Act or potential standards of the European Electronic Health Record Exchange Format.

### 4.3.1 mHealth assessment frameworks

Name	mHealth assessment frameworks
Purpose:	Assess mHealth applications before being approved by health authorities to be included in the list of prescribed and reimbursable apps. Dimensions evaluated include usability, interoperability, privacy and clinical effectiveness.
More information:	<a href="https://mhealth-hub.org/assessment-frameworks">https://mhealth-hub.org/assessment-frameworks</a>
Method or tool:	Tools
Tool access:	Different national frameworks: <a href="https://mhealth-hub.org/assessment-frameworks">https://mhealth-hub.org/assessment-frameworks</a>
Category:	Compliance to standards and norms
Applicable to:	Solutions
Implementation level:	From prototype to decision-maker adoption and scale-up
Target users:	Demand side (healthcare providers) Demand enabler (payers, procurers) Supply side (tech companies)



Evidence of success:	Initiated in Belgium, Denmark, Finland, France, Germany, Netherlands, Portugal, Spain and United Kingdom (UK)
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### 4.3.2 Digital health assessment technology

Name	Digital health assessment technology
Purpose:	Rapid certification of health apps in a repeatable process.
More information:	<a href="https://orchahealth.com/our-products/digital-health-assessment-technology/">https://orchahealth.com/our-products/digital-health-assessment-technology/</a>
Method or tool:	Tool
Tool access:	Commercial access
Category:	Compliance to standards and norms
Applicable to:	Solutions
Implementation level:	From prototype to decision-maker adoption and scale-up
Target users:	Demand side (healthcare providers) Demand enabler (payers, procurers) Supply side (tech companies)
Evidence of success:	Used in Nordic Digital Health Evaluation Criteria in Nordic countries and the Digital Technology Assessment Criteria in the UK.

## 4.4 Maturity and readiness levels

Seven maturity models and readiness levels tools are selected for the purpose of this deliverable. Four of them are general and can be applied to the implementation and scale-up of any digital health solutions. They include Technology Readiness Levels, Service and Business Readiness Levels, the IN4AHA Scale-up Model, the Scirocco Maturity Assessment Tool. Other tools are technology specific such as Momentum Telemedicine and the Telemedicine Community Readiness Level for telemedicine services or the family of HIMSS maturity adoption models.

### 4.4.1 Technology readiness levels

Name	Technology readiness levels
Purpose:	Estimate the maturity of technologies and enabling consistent and uniform discussions of technical maturity across different types of technology. The European Commission advised EU-funded research and innovation projects to adopt the scale in 2010.
More information:	<a href="https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf">https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf</a>
Method or tool:	Tool
Tool access:	NA
Category:	Maturity and readiness levels
Applicable to:	Solutions, Platforms
Implementation level:	From prototype to large-scale deployment
Target users:	Demand side (healthcare providers) Demand enabler (payers, procurers) Supply side (tech companies)

Evidence of success:	TRLs have been used from design to evaluate digital health. <sup>13</sup>
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#### 4.4.2 Services and business readiness levels

Name	Service and business readiness levels
Purpose:	Provide a readiness system for decision makers in need to move innovations to scale.
More information:	Scaling Digital Health Innovation: Developing a New ‘Service Readiness Level’ Framework of Evidence. <sup>14</sup> <a href="https://www.mdpi.com/1660-4601/18/23/12575">https://www.mdpi.com/1660-4601/18/23/12575</a>
Method or tool:	Tool
Tool access:	NA
Category:	Maturity and readiness levels
Applicable to:	Solutions, Platforms
Implementation level:	Scale-up, Large-scale deployment
Target users:	Demand side (healthcare providers) Demand enabler (payers, procurers) Supply side (tech companies)
Evidence of success:	Not evidence found.

#### 4.4.3 Scirocco Maturity Assessment Tool

Name	Scirocco Maturity Assessment Tool
Purpose:	Develop a radar diagram which reveals areas of strengths and also gaps in capability to implement integrated care in a country or region.
More information:	<a href="https://www.sciroccoexchange.com/">https://www.sciroccoexchange.com/</a>
Method or tool:	Method and tool
Tool access:	<a href="https://scirocco-exchange-tool.inf.ed.ac.uk/en_gb/login/">https://scirocco-exchange-tool.inf.ed.ac.uk/en_gb/login/</a>
Category:	Maturity and readiness levels
Applicable to:	Solutions, Platforms
Implementation level:	From decision-maker adoption to scale-up and large-scale deployment
Target users:	Demand side (healthcare providers) Demand enabler (payers, procurers) Supply side (tech companies)
Evidence of success:	Validated and used in more than 40 regions and translated to 10 languages. <sup>15</sup>

<sup>13</sup> Jansen-Kosterink S, Broekhuis M, van Velsen L. Time to act mature—Gearing eHealth evaluations towards technology readiness levels. Digital Health. 2022 Jul;8:20552076221113396.

<sup>14</sup> Hughes, J., Lennon, M., Rogerson, R.J. and Crooks, G., 2021. Scaling Digital Health Innovation: Developing a New ‘Service Readiness Level’ Framework of Evidence. International Journal of Environmental Research and Public Health, 18(23), p.12575.

<sup>15</sup> Grooten L, Vrijhoef HJ, Calciolari S, Ortiz LG, Janečková M, Minkman M, Devroey D. Assessing the maturity of the healthcare system for integrated care: testing measurement properties of the SCIROCCO tool. BMC medical research methodology. 2019 Dec;19(1):1-0.

#### 4.4.4 Momentum Telemedicine

Name	Momentum Telemedicine
Purpose:	Offers guidance for telemedicine doers who seek to move telemedicine from an idea or a pilot to daily practice or to scale.
More information:	<a href="http://telemedicine-momentum.eu/">http://telemedicine-momentum.eu/</a> <a href="https://digitalhealthuptake.eu/radar-repository/momentum-a-blueprint-for-mainstreaming-telemedicine-deployment-in-daily-practice/">https://digitalhealthuptake.eu/radar-repository/momentum-a-blueprint-for-mainstreaming-telemedicine-deployment-in-daily-practice/</a>
Method or tool:	Tool
Tool access:	Supporting documents: <a href="http://telemedicine-momentum.eu/resources-documents/">http://telemedicine-momentum.eu/resources-documents/</a>
Category:	Maturity and readiness levels
Applicable to:	Solutions, Platforms
Implementation level:	From pilot to scale-up and large-scale deployment
Target users:	Demand side (healthcare providers) Demand enabler (payers, procurers) Supply side (tech companies)
Evidence of success:	Tool tested in seven different telemedicine environments (Germany, Israel, Italy, the Netherlands, Norway, Spain, and Sweden). <sup>16</sup>

#### 4.4.5 IN4AHA Scale-up model

Name	IN4AHA Scale-up model
Purpose:	Intended for commercially driven entities whose innovative solution already has proof of feasibility on either local, regional, or national scale, but whose ambition is to expand to new target markets, either internationally or into different regions.
More information:	<a href="https://futurium.ec.europa.eu/en/active-and-healthy-living-digital-world/library/4-aha-deliverable-innovation-scale-model-and-roadmap-aha">https://futurium.ec.europa.eu/en/active-and-healthy-living-digital-world/library/4-aha-deliverable-innovation-scale-model-and-roadmap-aha</a>
Method or tool:	Tool
Tool access:	<a href="https://innovation4ageing.tehnopol.ee/scale-up-model/">https://innovation4ageing.tehnopol.ee/scale-up-model/</a>
Category:	Maturity and readiness levels
Applicable to:	Solutions, Platforms
Implementation level:	Scale-up, Large-scale deployment
Target users:	Supply side (tech companies) Supply enabler (innovation and digital health hubs) Demand side (healthcare providers) Demand enabler (payers, procurers)
Evidence of success:	IN-4-AHA Project - Innovation Networks for Scaling Active and Healthy Ageing <a href="https://innovation4ageing.tehnopol.ee/wp-content/uploads/2022/10/Final_IN-4-AHA-scale-up-model-and-roadmap-22-10-27_final.pdf">https://innovation4ageing.tehnopol.ee/wp-content/uploads/2022/10/Final_IN-4-AHA-scale-up-model-and-roadmap-22-10-27_final.pdf</a>

<sup>16</sup> Whitehouse, D. and Lange, M., 2017. Good Practice in Change Management: Deploying Telemedicine Services at Large-Scale. Benchmarking Telemedicine: Improving Health Security in the Balkans, 49, p.111.

#### 4.4.6 Telemedicine Community Readiness Level

Name	Telemedicine Community Readiness Level
Purpose:	Helps actors in communities to determine the current requirements for a successful telemedicine implementation.
More information:	<a href="http://care4saxony.de/?page_id=3837">http://care4saxony.de/?page_id=3837</a>
Method or tool:	Methodology and tool
Tool access:	<a href="http://care4saxony.de/?page_id=3840">http://care4saxony.de/?page_id=3840</a>
Category:	Maturity and readiness levels
Applicable to:	Solutions, Platforms
Implementation level:	From decision-maker adoption to scale-up, large-scale deployment
Target users:	Demand side (healthcare providers) Demand enabler (payers, procurers) Supply side (tech companies)
Evidence of success:	The Telemedicine community readiness model – successful telemedicine implementation and scale-up. <sup>17</sup>

#### 4.4.7 HIMSS Maturity Model Suites

Name	Scirocco Maturity Assessment Tool
Purpose:	Measures the maturity of different eHealth solutions applied in healthcare. It includes electronic medical records (EMRAM), outpatient electronic medical record (O-EMRAM), continuity of care (CCMM), digital imaging (DIAM), analytics maturity (AMAM), infrastructure (INFRAM) and a digital health index (DHI).
More information:	<a href="https://www.himss.org/what-we-do-solutions/digital-health-transformation/maturity-models">https://www.himss.org/what-we-do-solutions/digital-health-transformation/maturity-models</a>
Method or tool:	Tool
Tool access:	Commercial access
Category:	Maturity and readiness levels
Applicable to:	Solutions, Platforms, Integration
Implementation level:	From decision-maker adoption to scale-up and large-scale deployment.
Target users:	Demand side (healthcare providers) Demand enabler (payers, procurers) Supply side (tech companies)
Evidence of success:	Worldwide use in the hospital sector. <sup>18</sup>

<sup>17</sup> Otto L, Schlieter H, Harst L, Whitehouse D, Maeder A. The telemedicine community readiness model—successful telemedicine implementation and scale-up. *Frontiers in Digital Health*. 2023 Feb 23;5:21.

<sup>18</sup> Pettit, L., 2013. Understanding EMRAM and how it can be used by policy-makers, hospital CIOs and their IT teams. *World hospitals and health services: the official journal of the International Hospital Federation*, 49(3), pp.7-9.

## 4.5 Value assessment tools

Three value assessment methodologies and tools are selected for the purpose of this deliverable. Two of them, MAFEIP and ASSIST, can be applied to any digital health solution implementation while MAST is specific for the deployment of telemedicine services.

### 4.5.1 MAFEIP

Name	MAFEIP
Purpose:	Estimate the health and economic outcomes of different Information and Communication Technologies (ICT) enabled social and health innovations, including new care pathways, devices, surgical techniques, and organisational models.
More information:	<a href="https://www.mafeip.eu/the-tool">https://www.mafeip.eu/the-tool</a> <a href="https://futurium.ec.europa.eu/sites/default/files/2021-10/Blueprint%20guide%20on%20MAFEIP.pdf">https://futurium.ec.europa.eu/sites/default/files/2021-10/Blueprint%20guide%20on%20MAFEIP.pdf</a>
Method or tool:	Tool
Tool access:	<a href="https://tool.mafeip.eu/overview/">https://tool.mafeip.eu/overview/</a>
Category:	Value assessment tool
Applicable to:	Solutions, Platforms
Implementation level:	From decision-maker adoption to scale-up and large-scale deployment
Target users:	Demand side (healthcare providers) Demand enabler (payers, procurers) Supply side (tech companies)
Evidence of success:	Applied as a decision analytical modelling tool used in the context of multiple research and innovation projects and large-scale pilots.

### 4.5.2 ASSIST

Name	ASSIST
Purpose:	To help project leaders, entrepreneurs and start-ups to objectively and rigorously evaluate their solution from an evidence-based multi-stakeholder perspective.
More information:	<a href="https://assist.empirica.de/">https://assist.empirica.de/</a>
Method or tool:	Tool
Tool access:	<a href="https://assist.empirica.de/toolkit/">https://assist.empirica.de/toolkit/</a>
Category:	Value assessment tool
Applicable to:	Solutions, Platforms
Implementation level:	From decision-maker adoption to scale-up and large-scale deployment
Target users:	Demand side (healthcare providers) Demand enabler (payers, procurers) Supply side (tech companies)
Evidence of success:	ASSIST has been applied successfully in more than 85 pilot services and case studies since 2005.

### 4.5.3 MAST

Name	MAST - Model for Assessment of Telemedicine
Purpose:	To be used as a basis for decision making in EU and the European countries in decisions on use of telemedicine applications.
More information:	The MAST Manual: <a href="https://joinup.ec.europa.eu/sites/default/files/document/2014-12/The%20Model%20for%20Assessment%20of%20Telemedicine%20%28MAST%29%20Manual.pdf">https://joinup.ec.europa.eu/sites/default/files/document/2014-12/The%20Model%20for%20Assessment%20of%20Telemedicine%20%28MAST%29%20Manual.pdf</a>
Method or tool:	Tool
Tool access:	NA
Category:	Assessment tool
Applicable to:	Solutions, Platforms
Implementation level:	Scale-up, Large-scale deployment
Target users:	Demand side (healthcare providers) Demand enabler (payers, procurers) Supply side (tech companies)
Evidence of success:	Scoping review of empirical studies. <sup>19</sup>

<sup>19</sup> Kidholm, K., Clemensen, J., Caffery, L.J. and Smith, A.C., 2017. The Model for Assessment of Telemedicine (MAST): A scoping review of empirical studies. *Journal of telemedicine and telecare*, 23(9), pp.803-813.

## 5 Summary of results and next steps

Against the proposed DHU framework of methods and tools for digital health implementation and through the process of identification and categorisation, 18 methods and tools have been selected, described and classified in chapter 4. Five categories have been illustrated including “Design of solutions”, “Business modelling”, “Compliance with standards and norms”, “Maturity and readiness levels” and “Value assessment tools”. Two categories have not been illustrated, “Risk stratification tools” and “Digital skills development”. The following figure presents the results of the curation process distributed by categories and type of method and tool.

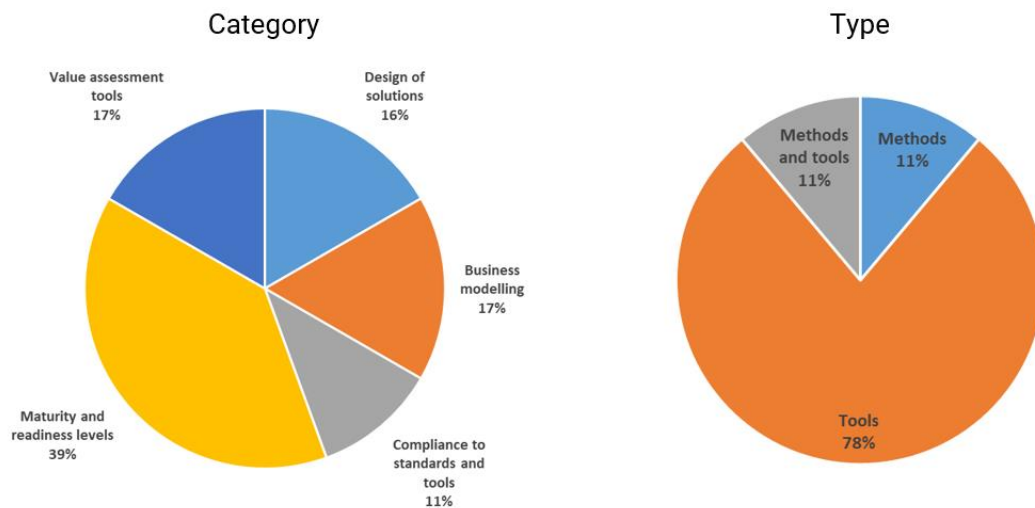


Figure 4. Distribution of selected methods and tools by category and type

Most methods and tools belong to the category of maturity models and readiness levels that have been widely use in the digital health field, followed by value assessment tools. However, these provisional results are not representative of the entire spectrum of potential methodologies for implementing and scaling up digital health solutions.

It is worth noting that the majority of identified practices are tools and therefore conceived for implementation.

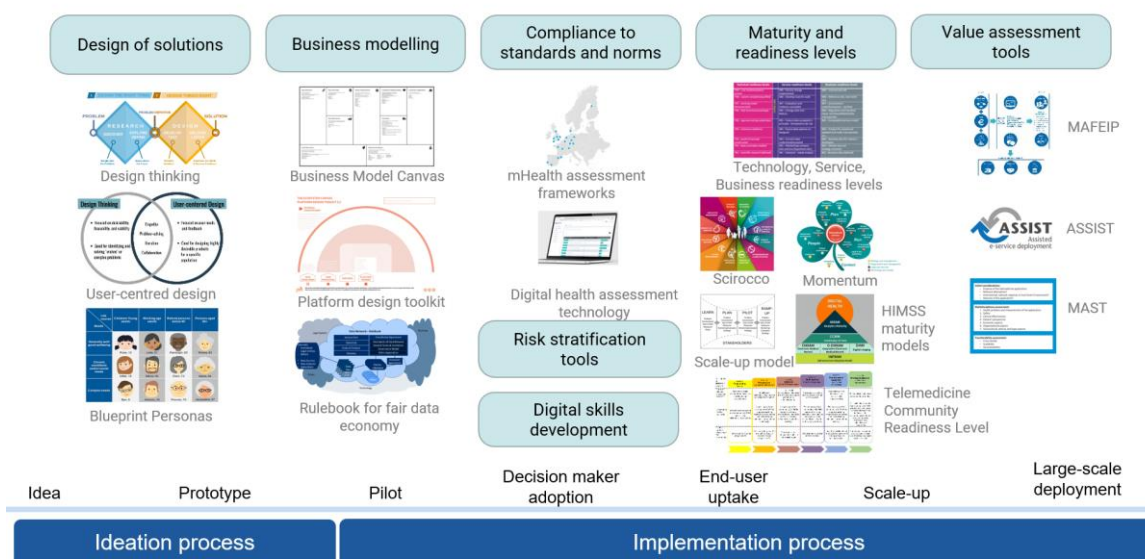


Figure 5. Visual summary of selected methods and tools

To conclude, Figure 4 presents a visual summary of all the methods and tools classified by categories along the ideation and implementation process exemplifying how digital health solutions and platforms developers and adopter can make use of different methodologies and tools to accelerate adoption and scale-up. Given the expertise of the consortium both supply, demand and enabler side are represented although methodologies and tools that are used by implementers are more represented in this selection.

## Next steps

Once the DHU framework of methods and tools for implementing digital health solutions is established, the next steps consist of populating the catalogue through the practices collected by the DHU Radar (WP2) and the proposed methodologies and tools derived from the interaction of digital health stakeholders in the knowledge community (WP3). A special focus on supply side methodologies will be encouraged to balance the ecosystem view of the catalogue of tools.

A call for trainings is planned in the following months and the trainings will be conducted in support to the twinnings foreseen in the second half of the project and the exchanges produced among Reference Sites, both tasks of WP4.

The consolidation of these different inputs in terms of methods and tools identification and classification, as well as the development of user guidance in support of the twinnings and Reference Sites will shape the second version of this report and will be object of a DHU digest.



## ANNEX I: List of selected methodologies and tools

Methodology/Tool	Category
Design thinking	Design of solutions
User-centred design	Design of solutions
Blueprint Personas	Design of solutions
Business Model Canvas	Business modelling
Platform Design Tool	Business modelling
Rulebook for fair data economy	Business modelling
Mobile health assessment frameworks	Compliance to standards and norms
Digital health assessment technology	Compliance to standards and norms
Technology Readiness Levels	Maturity and readiness levels
Service and Business Levels	Maturity and readiness levels
Scirocco Maturity Assessment Tool	Maturity and readiness levels
HIMSS Maturity Models	Maturity and readiness levels
Scale-up Model	Maturity and readiness levels
Telemedicine Momentum	Maturity and readiness levels
Telemedicine Community Readiness Model	Maturity and readiness levels
MAFEIP	Value assessment tools
ASSIST	Value assessment tools
MAST - Model for Assessment of Telemedicine	Value assessment tools